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Roll No.______ to be filled in by the candidate. **(For all sessions)**

Paper Code	6	1	9	3

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. The fraction $\dfrac{2x^2+5}{x-3}$ is:

(A) proper (B) rational (C) polynomial (D) improper

2. $(n+1)^{th}$ term of an A-P is:

(A) $a_1+(n-1)d$ (B) $a_1-(n-1)d$ (C) a_1+nd (D) a_1-nd

3. Multiplicative inverse of (1 , 0) is:

(A) (-1 , 0) (B) (0 , 1) (C) (0 , -1) (D) (1 , 0)

4. If $a,b \in G$ and G is a group, then $(ab)^{-1}$ is equal to:

(A) $a^{-1}b^{-1}$ (B) $b^{-1}a^{-1}$ (C) $\dfrac{-1}{ab}$ (D) $\dfrac{1}{(ab)^{-1}}$

5. If A is a subset of B and A=B then A is:

(A) proper subset of B (B) super set of B (C) improper subset of A (D) proper subset of A

6. Rank of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ is:

(A) 1 (B) 2 (C) 3 (D) 4

7. If A and B are any two non singular matrices then $(AB)^{-1}$ is equal to:

(A) $A^{-1}B^{-1}$ (B) $B^{-1}A^{-1}$ (C) BA (D) AB

8. An equation of the form $ax^2+bx+c=0$ is called quadratic if:

(A) $a=0$ (B) $b=0$ (C) $c=0$ (D) $a\neq 0$

9. The roots of $x^2+2x+3=0$ are:

(A) imaginary (B) real, equal (C) real, unequal (D) rational

10. $\cos^{-1}(-x)$ is equal to:

(A) $\cos^{-1}x$ (B) $\pi+\cos^{-1}x$ (C) $\pi-\cos^{-1}x$ (D) $\sin^{-1}x$

11. Number of solutions of trigonometric equation is:

(A) finite (B) Infinite (C) only one (D) all of these

12. The 5th term of sequence 3 , 6 , 12,......... is:

(A) $\frac{1}{48}$ (B) -48 (C) $-\frac{1}{48}$ (D) 48

13. For two events A and B if $P(A)=P(B)=\frac{1}{2}$, then $P(A\cap B)$ is:

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) 1 (D) Zero

14. $\frac{\underline{|3}}{\underline{|0}}$ equals.

(A) 3 (B) 6 (C) ∞ (D) 12

15. Middle term of $(a+b)^n$, when n is even is:

(A) $\left(\frac{n}{2}+1\right)^{th}$ term (B) $\left(\frac{n}{2}-1\right)^{th}$ term (C) $\frac{n}{2}^{th}$ term (D) $\left(\frac{n}{2}-2\right)^{th}$ term

16. The sum of binomial co-efficients in the expansion of $(1+x)^4$ is:

(A) 8 (B) 10 (C) 16 (D) 32

17. $1+\tan^2\theta$ is equal to:

(A) $\cot\theta$ (B) $\operatorname{cosec}\theta$ (C) $\sec^2\theta$ (D) $-\sec\theta$

18. $\tan\left(\frac{3\pi}{2}-\theta\right)$ is equal to:

(A) $\tan\theta$ (B) $-\cot\theta$ (C) $\cot\theta$ (D) $-\tan\theta$

19. Period of $\tan\frac{x}{2}$ is:

(A) π (B) 2π (C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{2}$

20. In any triangle ABC, with usual notations r_3 is:

(A) $\frac{\Delta}{S-a}$ (B) $\frac{S-b}{\Delta}$ (C) $\frac{S-c}{\Delta}$ (D) $\frac{\Delta}{S-c}$

Inter - (Part-I) -A-2015

Roll No._________ to be filled in by the candidate. **(For all sessions)**

Paper Code	6	0	1	9

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the rule of addition $\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$.

ii. Simplify i^9.

iii. Write any two proper subsets of a set $\{a,b,c\}$.

iv. Define a semi group.

v. Without expansion show that: $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix}=0$

vi. Evaluate $\left(1+w-w^2\right)^8$

vii. Write the converse and the inverse of the conditional $\sim p \rightarrow q$

viii. For $A=\{1,2,3,4\}$, find a relation $R=\{(x,y)/y=x\}$.

ix. By remainder theorem find remainder when x^2+3x+7 is divided by $x+1$.

x. If A is symmetric or Skew symmetric. Show that A^2 is symmetric.

xi. Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}=\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$.

xii. If α, β be the roots of $x^2-px-p-c=0$, prove that $(1+\alpha)(1+\beta)=1-c$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Resolve $\frac{1}{x^2-1}$ into partial fractions.

ii. Insert two G.Ms between 2 and 16.

iii. Find the value of n, when ${}^{n}C_{12}={}^{n}C_{6}$.

iv. Evaluate ${}^{9}P_{8}$

v. Expand upto 4 terms $(1-x)^{1/2}$.

vi. Calculate by means of binomial theorem, $(0.97)^3$.

vii. Write the first four terms of the sequence if $a_n=na_{n-1}, a_1=1$.

viii. If 5,8 are two A.Ms between a and b find a and b.

ix. If $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in H.P, find k.

x. Define probability and sample space.

xi. Determine the probability of getting 2 heads in two successive tosses of a balanced coin.

xii. Prove that $1+5+9+\dots\dots+(4n-3)=n(2n-1)$ for $n=1,2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find r, when $\ell=56cm \quad \theta=45^0$.

ii. Prove that: $\frac{1+\cos\theta}{1-\cos\theta}=(\cos ec\theta+\cot\theta)^2$.

iii. Prove that: $\tan\left(45^0+A\right)\tan\left(45^0-A\right)=1$.

iv. Prove that: $\frac{\cos 3\theta}{\cos\theta}+\frac{\sin 3\theta}{\sin\theta}=4\cos 2\theta$.

v. Find period of $\cos ec\frac{x}{4}$.

vi. Prove that: $\frac{\sin\alpha-\sin\beta}{\sin\alpha+\sin\beta}=\tan\frac{\alpha-\beta}{2}\cot\frac{\alpha+\beta}{2}$.

vii. If α,β,γ are the angles of a triangle ABC , then prove that $\cos(\alpha+\beta)=-\cos\gamma$.

viii. When the angle between the ground and the sun is 30^0, flag pole costs a shadow of 40m long. Find the height of the top of the flag.

ix. Find the measure of greatest angle if the sides of triangle are 16 , 20 , 33.

x. Find the area of the triangle ABC, if $a=18$, $b=24$, $c=30$.

xi. Show that: $\tan^{-1}(-x)=-\tan^{-1}x$.

xii. Find the solution of the equation $\sin x=-\frac{\sqrt{3}}{2}$ lie in $[0,2\pi]$.

xiii. Find solution of $\sec x=-2$ in $[0,2\pi]$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Solve the system of linear equation by Cramer's rule $2x+2y+z=3$; $3x-2y-2z=1$; $5x+y-3z=2$.

(b) Solve the equation: $x^{\frac{2}{5}}+8=6x^{\frac{1}{5}}$.

6. (a) Resolve $\frac{4x}{(x+1)^2(x-1)}$ into partial fractions.

(b) If a , b , c , d , are in G.P prove that a^2-b^2, b^2-c^2 , c^2-d^2 are also in G.P.

7. (a) Two dice are thrown. What is the probability that the sum of the number of dots appearing on them is 4 or 6.

(b) Find the general term in the expansion of $(1+x)^{-3}$, when $|x|<1$.

8. (a) Find the values of trigonometric functions, when $\theta=\frac{13\pi}{3}$. (b) Prove that: $\frac{\cos 8^0-\sin 8^0}{\cos 8^0+\sin 8^0}=\tan 37^0$.

9. (a) Show that: $\gamma=\alpha\sin\frac{\beta}{2}\sin\frac{\gamma}{2}\sec\frac{\alpha}{2}$. (b) Prove that: $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$.

Roll No.__________ to be filled in by the candidate.

(For all sessions)

Paper Code	6	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes

Marks: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If Z is a complex number, then $|Z|^2$ is:

(A) Z^2 (B) $(\overline{Z})^2$ (C) $Z\overline{Z}$ (D) $\frac{Z}{\overline{Z}}$

2. For any two sets A and B, $(A \cap B)'$ is equal to:

(A) A' (B) B' (C) $A' \cup B'$ (D) $A \cap B$

3. The multiplicative identity in the set of real numbers is:

(A) Zero (B) 1 (C) 3 (D) 2

4. A square matrix $A = [aij]$ with complex entries is called skew Hermitian if $(\overline{A})^t$ is equal to:

(A) A (B) -A (C) $|A|$ (D) $-|A|$

5. If A and B are any two non singular matrices such that $(AB)^{-1}$ is equal to:

(A) $A^{-1}B^{-1}$ (B) $B^{-1}A^{-1}$ (C) BA (D) AB

6. A reciprocal equation remains unchanged when variable x is replaced by:

(A) $\frac{1}{x}$ (B) $\frac{-1}{x}$ (C) $\frac{1}{x^2}$ (D) $-x$

7. The roots of equation $x^2 - 5x + 6 = 0$ are:

(A) 2 , -3 (B) -2 , -3 (C) 2 , 3 (D) -2 , 3

8. $(x-1)^2 = x^2 - 2x + 1$ is called:

(A) equation (B) conditional (C) identity (D) fraction

9. A.M between $3\sqrt{5}$ and $5\sqrt{5}$ is:

(A) $4\sqrt{5}$ (B) $5\sqrt{5}$ (C) 10 (D) $2\sqrt{5}$

10. n^{th} term of G.P is:

(A) $a_1 r^n$ (B) $a_1 r^{n-1}$ (C) $\frac{a}{r^n}$ (D) $\frac{r^n}{a}$

11. If $n=1$, then value of $n\underline{|n-1}$ is:

(A) Zero (B) 1 (C) 2 (D) -1

12. $\overset{n}{\underset{0}{C}}$ equals.

(A) 1 (B) n (C) zero (D) 2

13. General term of expansion $(a+x)^n$ is:

(A) $\binom{n+1}{r} a^{n-r} x^r$ (B) $\binom{n}{r-1} a^{n-r} x^r$ (C) $\binom{n}{r+1} a^r x^{n-r}$ (D) $\binom{n}{r} a^{n-r} x^r$

14. The sum of binomial co-efficients in the expansion of $(1+x)^4$ is:

(A) 8 (B) 10 (C) 16 (D) 32

15. $\cos^2 2\theta + \sin^2 2\theta$ is equal to:

(A) 1 (B) zero (C) $\sec^2\theta$ (D) 2

16. $\cos\left(\pi/2 - \beta\right)$ is equal to:

(A) $\sin\beta$ (B) $-\sin\beta$ (C) $\cos\beta$ (D) $-\cos\beta$

17. Period of $\operatorname{cosec} 10x$ is:

(A) $\frac{\pi}{10}$ (B) $\frac{2\pi}{5}$ (C) $\frac{\pi}{5}$ (D) $\frac{4\pi}{5}$

18. For any triangle ABC, with usual notations r_2 is equal to:

(A) $\frac{\Delta}{S-a}$ (B) $\frac{\Delta}{S-c}$ (C) $\frac{\Delta}{S-b}$ (D) $\frac{\Delta}{S}$

19. $\tan\left(\sin^{-1} x\right)$ is equal to:

(A) $1+2x^2$ (B) $1-x^2$ (C) $\frac{x}{\sqrt{1-x^2}}$ (D) $\frac{2x}{\sqrt{1+x^2}}$

20. The solutions of equation $\frac{1}{2}+\sin\theta=0$ are in quadrant.

(A) I & IV (B) I & III (C) III & IV (D) II & IV

Roll No.________ to be filled in by the candidate.

(For all sessions)

Paper Code	6	0	1	9

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Find the multiplicative inverse of (-4 , 7).

ii. Find real and imaginary parts of $\left(\sqrt{3}+i\right)^3$.

iii. Define equivalent sets.

iv. Define monoid.

v. Find the inverse of the matrix $A=\begin{bmatrix}3 & -1\\ 2 & 1\end{bmatrix}$.

vi. Show that $\begin{vmatrix}1 & 2 & 3x\\ 2 & 3 & 6x\\ 3 & 5 & 9x\end{vmatrix}=0$, without expansion.

vii. Find the value of λ if $A=\begin{bmatrix}4 & \lambda & 3\\ 7 & 3 & 6\\ 2 & 3 & 1\end{bmatrix}$ is singular.

viii. Define exponential equation.

ix. If $U=\{1,2,3,.........,10\}$, $A=\{2,4,6,........,20\}$ and $B=\{1,3,5,......,19\}$, prove that $(A\cup B)'=A'\cap B'$.

x. Write converse and contrapositive of the conditional $Nq \rightarrow Np$.

xi. Find three cube-cube roots of unity.

xii. If α,β are the roots of $3x^2-2x+4=0$, find the values of $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Resolve $\frac{1}{(x-1)(2x-1)}$ into partial fractions.

ii. Which term of the A.P 5,2,-1....is -85.

iii. Find the value of n if ${}^{n}P_{4} : {}^{n-1}P_{3} = 9:1$.

iv. Find the number of diagonals of 12 sided figure.

v. Find the first four terms of $(1+2x)^{-1}$.

vi. Find the 6th term in the expansion of $\left(x^2-\frac{3}{2x}\right)^{10}$.

vii. Find the next two terms of the sequence 1 , -3 , 5 , -7 , 9 , -11............

viii. If 5,8 are two A.Ms between a and b find a and b.

ix. Convert the recurring decimal $2.\dot{2}\dot{3}$ into the equivalent common fraction.

x. Convert $n(n-1)(n-2)......(n-r+1)$ in the factorial form.

xi. How many numbers greater than 1000,000 can be formed from digits 0 , 2 , 2 , 2 , 3 , 4 , 4.

xii. Show that inequality $4^n > 3^n + 4$ is true for $n=2,3$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Verify $2\sin 45^0+\frac{1}{2}co\sec 45^0=\frac{3}{\sqrt{2}}$.

ii. Prove that: $\cot^2\theta-\cos^2\theta=\cot^2\theta\cos^2\theta$.

iii. Find the value of $\tan 75^0$ (without calculator).

iv. Prove that: $\cos 306^0+\cos 234^0+\cos 162^0+\cos 18^0=0$.

v. Prove that $\sqrt{\dfrac{1+\sin\alpha}{1-\sin\alpha}}=\dfrac{\sin\alpha/2+\cos\alpha/2}{\sin\alpha/2-\cos\alpha/2}$.

vi. Prove that: $\sin\left(\dfrac{\pi}{4}-\theta\right)\sin\left(\dfrac{\pi}{4}+\theta\right)=\dfrac{1}{2}\cos 2\theta$.

vii. Find the period of $\operatorname{cosec}\dfrac{x}{4}$.

viii. Show that: $\tan\left(\sin^{-1}x\right)=\dfrac{x}{\sqrt{1-x^2}}$.

ix. Prove that $abc(\sin\alpha+\sin\beta+\sin\gamma)=4\Delta S$.

x. Define trigonometric equation.

xi. Find the area of triangle ABC, if $a=524$, $b=276$, $c=315$.

xii. Find the smallest angle of the triangle ABC, when $a=37.34$, $b=3.24$, $c=35.06$.

xiii. Find the solution of $\sec x=-2$ which lies in $[0,2\pi]$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Use Cramer's rule to solve the system $2x+2y+z=3$; $3x-2y-2z=1$; $5x+y-3z=2$.

(b) If α and β are the roots of $x^2-3x+5=0$ form the equation whose roots are $\dfrac{1-\alpha}{1+\alpha}$ and $\dfrac{1-\beta}{1+\beta}$.

6. (a) Resolve into partial fractions. $\dfrac{x^2}{(x-1)^2(x+1)}$.

(b) For what value of n $\dfrac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is G.M between a and b.

7. (a) How many arrangements of the letters of the word ATTACKED can be made

if each arrangement begins with C and ends with K.

(b) Find the co-efficient of x^5 in the expansion of $\left(x^2-\dfrac{3}{2x}\right)^{10}$.

8. (a) Prove the identity $\sin^6\theta-\cos^6\theta=\left(\sin^2\theta-\cos^2\theta\right)\left(1-\sin^2\theta\cos^2\theta\right)$.

(b) If $\sin\alpha=\dfrac{4}{5}$ and $\cos\beta=\dfrac{40}{41}$ where $0<\alpha<\pi/2$ and $0<\beta<\pi/2$ show that $\sin(\alpha-\beta)=\dfrac{133}{205}$.

9. (a) The sides of a triangle are x^2+x+1, $2x+1$ and x^2-1 prove that the greater angle of the triangle is 120^0.

(b) Prove that $\tan^{-1}\dfrac{1}{11}+\tan^{-1}\dfrac{5}{6}=\tan^{-1}\dfrac{1}{3}+\tan^{-1}\dfrac{1}{2}$.

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Inter. (Part-I)-A- 2017

Roll No.________ to be filled in

(For all sessions)

Paper Code	6	1	9	1

Mathematics (Objective Type) Group-I

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\overline{-a-ib}$ equals:

(A) $a+ib$ (B) $-a+ib$ (C) $a-ib$ (D) $-a-ib$

2. w^3 equals:

(A) 0 (B) -1 (C) i (D) 1

3. Sum of complex roots of unity equals:

(A) 0 (B) -1 (C) 1 (D) w

4. $(z,+)$ has no identity other than:

(A) 1 (B) -1 (C) i (D) 0

5. $(AB)^{-1}$ equals:

(A) $A^{-1}B^{-1}$ (B) A^{-1} (C) B^{-1} (D) $B^{-1}A^{-1}$

6. [8] is a:

(A) square matrix (B) unit matrix (C) scalar matrix (D) rectangular matrix

7. Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ will be of the form:

(A) $\frac{A}{x+1}+\frac{B}{x-1}$ (B) $\frac{Ax+B}{x+1}+\frac{C}{x-1}$ (C) $1+\frac{A}{x+1}+\frac{B}{x-1}$ (D) $\frac{Ax+B}{x^2-1}$

8. G.M between $2i$ and $8i$ equals:

(A) ±4 (B) 4 (C) -4 (D) $\pm4i$

9. No term in G.P is:

(A) 3 (B) 2 (C) 1 (D) 0

10. A die is rolled then n(s) equals:

(A) 36 (B) 6 (C) 1 (D) 9

11. The factorial form of 6.5.4 is:

(A) $\frac{6!}{3!}$ (B) $6!$ (C) $3!$ (D) $\frac{6!}{2!}$

12. In the expansion of $(3+x)^4$ middle term will be:

(A) 81 (B) $54x^2$ (C) $26x^2$ (D) x^4

13. The sum of odd coefficients in the expansion of $(1+x)^5$ is:

(A) 16 (B) 32 (C) 25 (D) 5

14. One radian equals:

(A) 45^0 (B) 50^0 (C) 60^0 (D) 57.296^0

15. $\sin\theta$ equals:

(A) $2\sin^2 \theta/2$ (B) $2\sin \theta/2 \cos \theta/2$ (C) $2\cos^2 \theta/2$ (D) $2\tan \theta/2$

16. Period of $\tan x/3$ is:

(A) π (B) 2π (C) 3π (D) $\pi/2$

17. Number of elements of a triangle are:

(A) 3 (B) 4 (C) 6 (D) 8

18. Radius of inscribed circle is:

(A) $\frac{\Delta}{S}$ (B) $\frac{S}{\Delta}$ (C) $\frac{\Delta}{S-c}$ (D) $\frac{4\Delta}{abc}$

19. $2\tan^{-1} A$ equals:

(A) $\tan^{-1}\left(\frac{A}{1-A^2}\right)$ (B) $\tan^{-1}\left(\frac{2A}{1+A^2}\right)$ (C) $\tan^{-1}\left(\frac{-2A}{1+A^2}\right)$ (D) $\tan^{-1}\left(\frac{2A}{1-A^2}\right)$

20. If $\cos x = \frac{\sqrt{3}}{2}, x \in [0,\pi]$, then x equals:

(A) $\frac{-\pi}{6}$ (B) $\frac{5\pi}{6}$ (C) $\frac{\pi}{6}$ (D) $\frac{7\pi}{6}$

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Inter - (Part-I) -A-2017

Roll No.__________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type) Group-I

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. 2x8=16

i. Show that $\forall z \in c\ z^2 + z^{-2}$ is a real number.

ii. Simplify by justifying each step $\dfrac{\frac{1}{a}-\frac{1}{b}}{1-\frac{1}{a}\cdot\frac{1}{b}}$.

iii. Write down the power set of { 9,11}.

iv. Solve by using quadratic formula $15x^2 + 2ax - a^2 = 0$

v. Convert $(A \cap B)' = A' \cup B'$ into logic form.

vi. If a, b are elements of a group G, solve $ax = b$.

vii. Show that $\begin{vmatrix} 2 & 3 & 0 \\ 3 & 9 & 6 \\ 2 & 15 & 1 \end{vmatrix} = 9\begin{vmatrix} 2 & 1 & 0 \\ 1 & 1 & 2 \\ 2 & 5 & 1 \end{vmatrix}$

viii. Prove that $\left(\dfrac{1+\sqrt{-3}}{2}\right)^9 + \left(\dfrac{1-\sqrt{-3}}{2}\right)^9 = -2$.

ix. Simplify $(5,-4) \div (-3,-8)$.

x. If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of a and b.

xi. If the matrices A and B are symmetric and AB=BA. Show that AB is symmetric.

xii. Show that roots of $(p+q)x^2 - px - q = 0$ are rational.

3. Write short answers of any eight parts from the following. 2x8=16

i. Resolve $\dfrac{1}{x^2-1}$ into partial fractions.

ii. Find next two terms of sequence -1,2,12,40,........

iii. Find A.M between $x-3$ and $x+5$.

iv. Write 8.7.6.5 in the factorial form.

v. Evaluate ${}^{12}P_5$.

vi. If ${}^{n}C_8 = {}^{n}C_{12}$ find n.

vii. Find vulgar fraction equivalent to $0.\dot{7}$ recurring decimal.

viii. If the numbers $\dfrac{1}{k}, \dfrac{1}{2k+1}$ and $\dfrac{1}{4k-1}$ are in Harmonic sequence, find k.

ix. Determine the probability of getting 2 heads in two successive tosses of a balanced coin.

x. Show that $4^n > 3^n + 4$ is not true for $n = 1$.

xi. Calculate $(2.02)^4$ by means of binomial theorem.

xii. Expand $(1+2x)^{-1}$ upto four terms.

4. Write short answers of any nine parts from the following. 2x9=18

i. Convert $18^0 6' 21''$ to decimal form.

ii. Prove that: $\cos^2\theta - \sin^2\theta = \cos^4\theta - \sin^4\theta$.

iii. Find the value of $\tan 105^0$ (without calculator).

iv. Prove that: $\dfrac{\sin 3x - \sin x}{\cos x - \cos 3x} = \cot 2x$.

v. Find the value of $\sec(-300^0)$ (without table).

vi. Find the domain and range of $\sec x$.

vii. Define angle of elevation.

viii. The area of triangle is 2437 and $a=79, c=97$, find β.

ix. Show that $\tan(\sin^{-1}x)=\frac{x}{\sqrt{1-x^2}}$.

x. Define trigonometric equation.

xi. Verify $\sin^2\frac{\pi}{6}:\sin^2\frac{\pi}{4}:\sin^2\frac{\pi}{3}:\sin^2\frac{\pi}{2}=1:2:3:4$.

xii. A kite is flying at a height of 67.2m is attached to a fully stretched string inclined at an angle of 55^0 to the horizontal. Find the length of the string.

xiii. Solve $\sin x+\cos x=0$, where x lies in $[0,2\pi]$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $A=\begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$, show that $A+(\overline{A})^t$ is Hermitian.

(b) If the roots of $px^2+qx+q=0$, are α and β, then prove that $\sqrt{\alpha/\beta}+\sqrt{\beta/\alpha}+\sqrt{q/p}=0$

6. (a) Resolve $\frac{x^2}{(x-2)(x-1)^2}$ into partial fractions.

(b) Insert five Harmonic means between $\frac{1}{4}$ and $\frac{1}{24}$.

7. (a) Find the value of n and r, when ${}^{n}C_{r}=35$ and ${}^{n}P_{r}=210$.

(b) Identify the series $1+\frac{1}{3}+\frac{1}{3.6}+\frac{1}{3.6.9}+$............ as a Binomial expansion and find its sum.

8. (a) If $\operatorname{cosec}\theta=\frac{m^2+1}{2m}$ and $m>0, \left(0<\theta<\frac{\pi}{2}\right)$ find the values of the remaining trigonometric ratios.

(b) Reduce $\sin^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

9. (a) Solve the triangle using first law of tangent and then law of sines $a=319$, $b=168$, $r=110^022'$.

(b) Prove that $\sin^{-1}\frac{77}{85}-\sin^{-1}\frac{3}{5}=\cos^{-1}\frac{15}{17}$.

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Roll No.__________ to be filled in by the candidate. (For all sessions)

Paper Code	6	1	9	2

Mathematics (Objective Type) Group-II

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\left|-\frac{1}{2}+\frac{\sqrt{3}}{2}i\right|$ equals:

(A) 3 (B) 2 (C) 1 (D) zero

2. If a and b are elements of a group G, then $(ab)^{-1}$ equals:

(A) $a^{-1}b^{-1}$ (B) $b^{-1}a^{-1}$ (C) $a^{-1}b$ (D) $b^{-1}a$

3. For any non-singular matrix A, A^{-1} equals:

(A) $\frac{adjA}{A}$ (B) $\frac{adjA}{|A|}$ (C) $\frac{|A|}{adjA}$ (D) $|A|.adjA$

4. A square matrix A is said to be Hemitian if:

(A) $(\overline{A})^t = A$ (B) $(\overline{A})^t = -A$ (C) $(\overline{A})^t = -\overline{A}$ (D) $(\overline{A})^t = \overline{A}$

5. If α, β are the roots of $4x^2+5x-6=0$, then value of $4\alpha+4\beta$ equals:

(A) $-5/4$ (B) -5 (C) -6 (D) 5

6. If w is cube root of unity, then $1+w^{28}+w^{29}$ equals:

(A) 1 (B) zero (C) w (D) w^2

7. The partial fraction of $\frac{1}{(x+1)(x^2-1)}$ will be of the form:

(A) $\frac{A}{x+1}+\frac{Bx+C}{x^2-1}$ (B) $\frac{A}{x+1}+\frac{B}{(x+1)^2}+\frac{C}{x-1}$ (C) $\frac{A}{x^2-1}+\frac{B}{x+1}$ (D) $\frac{A}{x+1}+\frac{B}{x^2-1}$

8. Arithmetic Mean between two numbers $\frac{1}{a}$ and $\frac{1}{b}$ is:

(A) $\frac{a+b}{2}$ (B) $\frac{2}{a+b}$ (C) $\frac{a+b}{2ab}$ (D) $\frac{2ab}{a+b}$

9. If A, G, H have their usual meanings and a and b are positive distinct real numbers and G>0 , then

(A) A<G<H (B) A>G>H (C) A<H<G (D) A>H>G

10. If A and B are disjoint events, then $p(A\cup B)$ equals:

(A) $P(A)+P(B)$ (B) $P(A)+P(B)-P(A\cap B)$ (C) $P(A)+P(B)+P(A\cap B)$ (D) $P(A)-P(B)$

11. If two dice are thrown simultaneously, then the number of elements in the sample space are:

(A) 6 (B) 12 (C). 24 (D) 36

12. The number of terms in the expansion of $(1+x)^{\frac{1}{2}}, |x|<1$ are:

(A) 2 (B) n (C) $\frac{n}{2}$ (D) infinite

13. If n is positive integer , then $n^2 > n+3$ is true when:

(A) $n\geq 3$ (B) $n\geq 2$ (C) $n\geq 1$ (D) $n\leq 3$

14. $\cot^2\theta-\operatorname{cosec}^2\theta$ equals:

(A) 1 (B) -1 (C) $\cot\theta$ (D) $\operatorname{cosec}\theta$

15. $\frac{3\pi}{2}+\theta$ lies in:

(A) 1st quadrant (B) 2nd quadrant (C) 3rd quadrant (D) 4th quadrant

16. Period of $\cos\frac{x}{2}$ is:

(A) π (B) 2π (C) 4π (D) $\frac{\pi}{2}$

17. With usual notaions, in any triangle ABC, if $\Delta=20$ a=4 , b=6 , c=10, then r equals:

(A) 2 (B) 5 (C) 10 (D) 15

18. $\sin\left(\sin^{-1}\left(\frac{1}{2}\right)\right)$ equals:

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

19. With usual notations, r_1 equals:

(A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ (C) $\frac{\Delta}{s-b}$ (D) $\frac{\Delta}{s-c}$

20. If $\sin x=-\frac{\sqrt{3}}{2}$, then refrence angle is:

(A) $\frac{\pi}{6}$ (B) $-\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $-\frac{\pi}{3}$

Roll No.________ to be filled in by the candidate.

(For all sessions)

Mathematics (Essay Type) Group-II

Time: 2:30 Hours

Marks: 80

Section -I

2. Write short answers of any eight parts from the following. 2x8=16

i. Simplify $(a+ib)^3$.

ii. If B={1,2,3}, find the power set of B.

iii. Define the conjunction.

iv. Define the identity martix.

v. If $z=a+ib$ show that $(z-\bar{z})^2$ is real number.

vi. Show that $x^3+y^3=(x+y)(x+wy)(x+w^2y)$.

vii. Evaluate the determinent of $A=\begin{bmatrix}1 & -2 & 3\\ 2 & 3 & 1\\ 4 & -3 & 2\end{bmatrix}$.

viii. If $A=\begin{bmatrix}1 & -1\\ a & b\end{bmatrix}$ and $A^2=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ find the values of a and b.

ix. Does the set $\{0,-1\}$ have closure property w.r.t addition and multiplication?

x. Solve the equation by completing square $x^2-3x-648=0$.

xi. If a, b are elements of a group G, then show that $(ab)^{-1}=b^{-1}a^{-1}$.

xii. If α,β are the roots of the equation $3x^2-2x+4=0$, find the values of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$.

3. Write short answers of any eight parts from the following. 2x8=16

i. Define proper rational fraction.

ii. Write next two terms of -1,2,12,40,............

iii. If $S_n=n(2n-1)$, then find the series.

iv. Insert two G.Ms between 1 and 8.

v. Expand $(1-x)^{1/2}$ upto 4 terms.

vi. Prove that ${}^{n}C_{r}={}^{n}C_{n-r}$.

vii. How many 5-digit multiples of 5 can be formed from the digits 2,3,5,7,9 (no digit repeated).

viii. Determine the probability of getting 2 heads in two successive tosses of a balanced coin.

ix. A die is rolled. Find the probability that the dots on top are prime numbers or odd numbers.

x. Show that $1+5+9+......+(4n-3)=n(2n-1)$ is true for $n=1$ and $n=2$.

xi. Using binomial theorem find the value of $\sqrt{99}$.

xii. Find the General term of $\left(\frac{a}{2}-\frac{2}{a}\right)^6$.

4. Write short answers of any nine parts from the following. 2x9=18

i. Convert $54^0 45'$ into radians.

ii. Find x, if $\tan^2 45^0-\cos^2 60^0=x\sin 45^0\cos 45^0\tan 60^0$.

iii. Prove that: $\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}=2\sec^2\theta$.

iv. Prove that: $\cot(\alpha+\beta)=\frac{\cot\alpha\cot\beta-1}{\cot\alpha+\cot\beta}$.

v. Find the value of $\sin 105^0$.

vi. Express $\cos(x+y)\sin(x-y)$ as sum or difference.

vii. Find the period of $\sin \frac{x}{5}$.

viii. State the law of cosine.

ix. Show that: $\frac{1}{r}=\frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}$.

x. Find domain and range of $y=\cos^{-1}x$.

xi. Solve the equation $1+\cos x=0$.

xii. Find the solution of $\sec x=-2$, $x\in[0,2\pi]$.

xiii. Find the area of the triangle ABC in which a=18 , b=24 , c=30.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Show that $\begin{vmatrix} a+\lambda & b & c \\ a & b+\lambda & c \\ a & b & c+\lambda \end{vmatrix}=\lambda^2(a+b+c+\lambda)$

(b) If α and β are the roots of $5x^2-x-2=0$ form the equation roots are $\frac{3}{\alpha}$ and $\frac{3}{\beta}$.

6. (a) Resolve $\frac{1}{(x-3)^2(x+1)}$ into partial fractions.

(b) If the (Positive) G.M and H.M between two numbers are 4 and $\frac{16}{5}$, find the numbers.

7. (a) How many numbers greater than one million can be formed from the digits 0,2,2,2,3,4,4?

(b) Find the co-efficient of the term involving x^{-1} in the expansion of $\left(\frac{3x}{2}-\frac{1}{3x}\right)^{11}$.

8. (a) Prove that: $\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}=\tan\theta+\sec\theta$.

(b) Prove that: $\frac{\sin\alpha-\sin\beta}{\sin\alpha+\sin\beta}=\tan\frac{\alpha-\beta}{2}\cot\frac{\alpha+\beta}{2}$.

9. (a) Prove that in an equilateral triangle $r:R:r_1=1:2:3$.

(b) Prove that $\sin^{-1}\frac{5}{13}+\sin^{-1}\frac{7}{25}=\cos^{-1}\frac{253}{325}$.

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Roll No.________ to be filled in by the candidate.	(For all sessions)	Paper Code	6	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If n is a positive even integer, then $\binom{n}{1}+\binom{n}{3}+\binom{n}{5}+\ldots\ldots+\binom{n}{n-1}$ is equal to:

(A) 2^n (B) 2^{n+1} (C) 2^{n-1} (D) 3^n

2. An angle in the standard position whose terminal side falls on $x-$axis or $y-$axis is:

(A) General angle (B) coterminal angle (C) Quadrantal angle (D) acute angle

3. $\cos(\pi+\theta)$ is equal to:

(A) $\sec\theta$ (B) $-\cos\theta$ (C) $\cos\theta$ (D) $-\sec\theta$

4. Range of Cosine function is:

(A) $(-1,1)$ (B) $[-1,1]$ (C) $[-1,1)$ (D) $(-1,1]$

5. In any $\triangle ABC$ $rr_1r_2r_3 =$ ______

(A) Δ^4 (B) Δ^3 (C) Δ^2 (D) Δ

6. With usual notation $\sqrt{\dfrac{(s-b)(s-c)}{bc}}$ is equal to:

(A) $\cos\dfrac{\alpha}{2}$ (B) $\sin\dfrac{\alpha}{2}$ (C) $\sin\dfrac{\beta}{2}$ (D) $\sin\dfrac{\gamma}{2}$

7. $\cos^{-1}(-x)$ is equal to:

(A) $\dfrac{\pi}{2}-\sin^{-1}x$ (B) $\dfrac{\pi}{2}+\sin^{-1}x$ (C) $\pi+\cos^{-1}x$ (D) $\pi-\cos^{-1}x$

8. Solution of the equation $\tan x+1=0$ is:

(A) $\left\{\dfrac{3\pi}{4}+n\pi\right\}$ (B) $\left\{\dfrac{\pi}{4}+n\pi\right\}$ (C) $\{\pi+n\pi\}$ (D) $\{2\pi+n\pi\}$, when $n\in z$

9. If $z=a+ib$, what is the value of $\cos\theta$?

(A) $\dfrac{a}{|z|}$ (B) $\dfrac{b}{|z|}$ (C) $\dfrac{a}{b}$ (D) $\dfrac{b}{a}$

10. A function $f: A \to B$ is surjective if:

(A) Range $f = A$ (B) Range $f = B$ (C) Range $f \neq B$ (D) Range $f \neq A$

11. Determinant of any unit matrix has value:

(A) Greater than 1 (B) less than 1 (C) 1 (D) zero

12. A square matrix A is skew -symmetric if A^t is equal to:

(A) A (B) -A (C) A^t (D) A^2

13. The discriminant of $ax^2 + bx + c = 0$, $a \neq 0$ is:

(A) $b^2 + 4ac$ (B) $4ac - b^2$ (C) $b^2 - 4ac$ (D) $a^2 - 4ac$

14. The degree of the equation $x^3 + 3x^2 + 4x + 5 = 0$ is

(A) 4 (B) 3 (C) 2 (D) 1

15. $\dfrac{x^2+1}{Q(x)}$ will be improper fraction if

(A) Degree of $Q(x) = 2$ (B) Degree of $Q(x) = 3$

(C) Degree of $Q(x) = 4$ (D) Degree of $Q(x) = 5$

16. $\sum_{K=1}^{n} K$ is equal to:

(A) $\dfrac{n+1}{2}$ (B) $\dfrac{n}{2}$ (C) $\dfrac{n(n+1)}{2}$ (D) $\dfrac{n(n-1)}{2}$

17. The geometric mean between $-2i$ and $8i$ is:

(A) ± 1 (B) ± 2 (C) ± 3 (D) ± 4

18. If A and B are mutually exclusive events, then $P(A \cup B)$ is equal to:

(A) $P(A)+P(B)$ (B) $P(A)-P(B)$ (C) $P(AB)$ (D) $P(A) \cap P(B)$

19. If ${}^{n}C_{8} = {}^{n}C_{12}$, then n is equal to:

(A) 8 (B) 12 (C) 20 (D) 0

20. In the expansion of $(x+y)^8$, middle term is:

(A) T_4 (B) T_6 (C) T_3 (D) T_5

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Roll No.________ to be filled in by the candidate.	(For all sessions)	Paper Code	6	1	9	7

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. The geometric mean between $-2i$ and $8i$ is:

(A) ± 1 (B) ± 2 (C) ± 3 (D) ± 4

2. If A and B are mutually exclusive events, then $P(A\cup B)$ is equal to:

(A) $P(A)+P(B)$ (B) $P(A)-P(B)$ (C) $P(AB)$ (D) $P(A)\cap P(B)$

3. If ${}^{n}C_{8}={}^{n}C_{12}$, then n is equal to:

(A) 8 (B) 12 (C) 20 (D) 0

4. In the expansion of $(x+y)^{8}$, middle term is:

(A) T_4 (B) T_6 (C) T_3 (D) T_5

5. If n is a positive even integer, then $\binom{n}{1}+\binom{n}{3}+\binom{n}{5}+\dots\dots+\binom{n}{n-1}$ is equal to:

(A) 2^n (B) 2^{n+1} (C) 2^{n-1} (D) 3^n

6. An angle in the standard position whose terminal side falls on $x-$axis or $y-$axis is:

(A) General angle (B) coterminal angle (C) Quadrantal angle (D) acute angle

7. $\cos(\pi+\theta)$ is equal to:

(A) $\sec\theta$ (B) $-\cos\theta$ (C) $\cos\theta$ (D) $-\sec\theta$

8. Range of Cosine function is:

(A) $(-1,1)$ (B) $[-1,1]$ (C) $[-1,1)$ (D) $(-1,1]$

9. In any ΔABC $rr_1r_2r_3=$ ______

(A) Δ^4 (B) Δ^3 (C) Δ^2 (D) Δ

10. With usual notation $\sqrt{\frac{(s-b)(s-c)}{bc}}$ is equal to:

(A) $\cos\frac{\alpha}{2}$ (B) $\sin\frac{\alpha}{2}$ (C) $\sin\frac{\beta}{2}$ (D) $\sin\frac{\gamma}{2}$

11. $\cos^{-1}(-x)$ is equal to:

(A) $\frac{\pi}{2}-\sin^{-1}x$ (B) $\frac{\pi}{2}+\sin^{-1}x$ (C) $\pi+\cos^{-1}x$ (D) $\pi-\cos^{-1}x$

12. Solution of the equation $\tan x+1=0$ is:

(A) $\left\{\frac{3\pi}{4}+n\pi\right\}$ (B) $\left\{\frac{\pi}{4}+n\pi\right\}$ (C) $\{\pi+n\pi\}$ (D) $\{2\pi+n\pi\}$, when $n\in z$

13. If $z=a+ib$, what is the value of $\cos\theta$?

(A) $\frac{a}{|z|}$ (B) $\frac{b}{|z|}$ (C) $\frac{a}{b}$ (D) $\frac{b}{a}$

14. A function $f:A\to B$ is surjective if:

(A) Range $f=A$ (B) Range $f=B$ (C) Range $f\neq B$ (D) Range $f\neq A$

15. Determinant of any unit matrix has value:

(A) Greater than 1 (B) less than 1 (C) 1 (D) zero

16. A square matrix A is skew -symmetric if A^t is equal to:

(A) A (B) -A (C) A^t (D) A^2

17. The discriminant of $ax^2+bx+c=0$, $a\neq 0$ is:

(A) b^2+4ac (B) $4ac-b^2$ (C) b^2-4ac (D) a^2-4ac

18. The degree of the equation $x^3+3x^2+4x+5=0$ is

(A) 4 (B) 3 (C) 2 (D) 1

19. $\frac{x^2+1}{Q(x)}$ will be improper fraction if

(A) Degree of $Q(x)=2$ (B) Degree of $Q(x)=3$

(C) Degree of $Q(x)=4$ (D) Degree of $Q(x)=5$

20. $\sum_{K=1}^{n} K$ is equal to:

(A) $\frac{n+1}{2}$ (B) $\frac{n}{2}$ (C) $\frac{n(n+1)}{2}$ (D) $\frac{n(n-1)}{2}$

Roll No._________ to be filled in by the candidate. (For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. 2x8=16

i. Separate into real and imaginary parts $\frac{i}{1+i}$.

ii. Simplify $\left(\frac{-1}{2}-\frac{\sqrt{3}}{2}i\right)^3$.

iii. Write the converse and inverse of $q \to p$.

iv. Define the terms proper and improper subsets with example.

v. Find inverse of $\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$.

vi. Differentiate between I_n to and on to function.

vii. For a square matrix A, $|A| = |A^t|$.

viii. What is Rank of matrix? Explain with example.

ix. Solve $15x^2+2ax-a^2=0$ by quadratic formula.

x. If α, β are roots of $3x^2-2x+4=0$, find $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$.

xi. Does the set $\{0,-1\}$ possess closure property w.r.t "Addition" and "multiplication"?

xii. Show that roots of equation $(p+q)x^2-px-q=0$ are rational.

3. Write short answers of any eight parts from the following. 2x8=16

i. Resolve into partial fractions $\frac{x^2+1}{x^2-1}$.

ii. If $y=1+\frac{x}{2}+\frac{x^2}{4}+\dots\dots\dots\infty$, show that $x=\frac{2(y-1)}{y}$.

iii. Prove that $\sum_{k=1}^{n} K = \frac{n(n+1)}{2}$.

iv. Find n, if ${}^{n}P_2 = 30$.

v. Find n, if ${}^{n}C_{10} = \frac{12\times 11}{2!}$.

vi. Define the probability.

vii. If 5 and 8 are arithematic means between a and b find a and b.

viii. Find 12th term of Harmonic progression $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}$, ________

ix. In how many ways 4 keys be arranged on a circular key ring?

x. Prove the formula $1+3+5+\dots\dots+(2n-1)=n^2$ for $n=1,2$.

xi. Find the term involving x^4 in the expansion of $(3-2x)^7$.

xii. Use binomial theorem, find the value to three decimal places $(1.03)^{\frac{1}{3}}$.

4. Write short answers of any nine parts from the following. 2x9=18

i. Verify $2\sin 45^0 + \frac{1}{2}\operatorname{cosec} 45^0 = \frac{3}{\sqrt{2}}$.

ii. Prove that: $\frac{2\tan\theta}{1+\tan^2\theta} = 2\sin\theta\cos\theta$.

iii. Prove that $\tan(45^0+A)\tan(45^0-A)=1$.

iv. Prove that: $\dfrac{\sin 2\alpha}{1+\cos 2\alpha}=\tan\alpha$.

v. Define period of a trigonometric function.

vi. Prove that $\gamma=(s-a)\tan\dfrac{\alpha}{2}$.

vii. Prove that $\tan^{-1}\dfrac{1}{4}+\tan^{-1}\dfrac{1}{5}=\tan^{-1}\dfrac{9}{19}$.

viii. Solve $\sin x+\cos x=0$.

ix. Solve the trigonometric equation $\sec^2\theta=\frac{4}{3}$.

x. Find the radius of the circle in which the arm of the central angle of measure 1 radian cut off an arc of length 35cm.

xi. If α,β be the angle of a triangle ABC then prove that $\cos\left(\dfrac{\alpha+\beta}{2}\right)=\sin\frac{\gamma}{2}$.

xii. Find the smallest angle of ΔABC, when $a=37.34$, $b=3.24$, $c=35.06$.

xiii. Find area of triangle ABC given three sides $a=18$, $b=24$, $c=30$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Convert into logical form and prove by truth table of $(A\cap B)'=A'\cup B'$.

(b) Find the value of λ if given system has non-trivial solution

$$x_1+4x_2+\lambda x_3=0, 2x_1+x_2-3x_3=0, 3x_1+\lambda x_2-4x_3=0$$

6. (a) If α,β are the roots of $x^2-px-p-c=0$, then prove that: $(1+\alpha)(1+\beta)=1-C$.

(b) Resolve into partial fraction $\dfrac{x^2+a^2}{(x^2+b^2)(x^2+c^2)(x^2+d^2)}$

7. (a) The sum of 9 terms of a A.P is 171 and its eighth term is 31. Find the series.

(b) If x is very nearly equal 1 then prove that: $px^p-qx^q=(p-q)x^{p+q}$.

8. (a) Find the value of remaining trigonometric function of $\sin\theta=-\dfrac{1}{\sqrt{2}}$

and the terminal arm of the angle is not in quad III.

(b) Prove that: $\dfrac{\sin 3\theta}{\cos\theta}+\dfrac{\cos 3\theta}{\sin\theta}=2\cot 2\theta$.

9. (a) Prove that: $r_1+r_2+r_3-r=4R$.

(b) Prove that: $\sin^{-1}\dfrac{3}{5}+\sin^{-1}\dfrac{8}{17}=\sin^{-1}\dfrac{77}{85}$.

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Roll No.________ to be filled in by the candidate.	(For all sessions)	Paper Code	6	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If $z=\cos\theta+i\sin\theta$, then $|z|$ is equal to:

(A) 0 (B) 1 (C) 2 (D) 3

2. For any two subsets A and B of set $\cup$, then $(A\cup B)'$ is equal to:

(A) $A\cup B'$ (B) $A\cap B'$ (C) $A'\cup B'$ (D) $A'\cap B'$

3. If "A" is a square matrix and $(\overline{A})^t=-A$, then "A" is called:

(A) Skew Symmetric (B) Symmetric (C) Skew Hermitian (D) Hermitian

4. If $A=\begin{bmatrix}4 & x & 3\\ 7 & 3 & 6\\ 2 & 3 & 1\end{bmatrix}$ is a singular matrix, then 'x' is equal to:

(A) 3 (B) 4 (C) 6 (D) 7

5. If α and β are roots of $ax^2+bx+c=0$, then $\alpha.\beta$ is equal to:

(A) $-b/a$ (B) a/b (C) c/a (D) a/c

6. If "w" is a cube root of unity, then $(1+w-w^2)(1-w+w^2)$ will be equal to:

(A) 3 (B) 4 (C) 2 (D) 1

7. If $\dfrac{3}{(x-1)(x+2)}=\dfrac{1}{x-1}+\dfrac{A}{x+2}$, then "A" is equal to:

(A) -1 (B) 3 (C) 2 (D) 4

8. The n^{th} root of product of n Geometric Means between a and b is equal to:

(A) $(ab)^{1/n}$ (B) $a^n b^n$ (C) $n\sqrt{ab}$ (D) $\sqrt{ab}$

9. If in an A.P; $a_{n-3}=2n-5$, then a_n will be equal to:

(A) $2n+1$ (B) $2n-1$ (C) $n+1$ (D) $n-1$

10. $\dfrac{n!}{(n-r)!r!}$ is equal to:

(A) ${}^rC_n$ (B) ${}^rP_n$ (C) ${}^nC_r$ (D) ${}^nP_r$

11. Number of signals given by 5 flags of different colours using 3 flags at a time equals.

(A) 30 (B) 40 (C) 50 (D) 60

12. Sum of even co-efficient in the expansion of $(1+x)^n$ equals.

(A) 2^{n+1} (B) 2^{n-1} (C) 2^n (D) 2^{1-n}

13. Third term in the expansion of $(1-2x)^{1/3}$ is equal to:

(A) $-9x^2/4$ (B) $9x^2/4$ (C) $4x^2/9$ (D) $-4x^2/9$

14. The area of a sector of circular region of radius r and angle θ is equal to:

(A) $\frac{1}{2}r\theta^2$ (B) $\frac{1}{2}r^2\theta$ (C) $r\theta^2$ (D) $r^2\theta$

15. If $6\cos^2\theta+2\sin^2\theta=5$, then $\tan^2\theta$ will be equal to:

(A) $\frac{3}{2}$ (B) 3 (C) $\frac{1}{3}$ (D) $\frac{2}{3}$

16. Period of $\sin\frac{x}{5}$ is equal to:

(A) 10π (B) 5π (C) 2π (D) $\frac{2\pi}{5}$

17. In an oblique triangle, if $a=200$; $b=120$ and included angle $\gamma=150^0$, then its area will be equal to:

(A) 6000 (B) 5000 (C) 2000 (D) 12000

18. If "R" is the circum-radius, then its value is:

(A) $\frac{ac}{4\Delta}$ (B) $\frac{ab}{4\Delta}$ (C) $\frac{abc}{4\Delta}$ (D) $\frac{abc}{\Delta}$

19. The value of $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$ is equal to:

(A) 1 (B) -1 (C) $\frac{-1}{2}$ (D) $\frac{1}{2}$

20. The solution of $\cos ec\theta=2$ in interval $[0,2\pi]$ is equal to:

(A) $\frac{\pi}{6},\frac{7\pi}{6}$ (B) $\frac{\pi}{6},\frac{5\pi}{6}$ (C) $\frac{\pi}{3},\frac{5\pi}{6}$ (D) $\frac{\pi}{3},\frac{\pi}{6}$

Inter - (Part-I) -A-2019

Roll No.________ to be filled in by the candidate. **(For all sessions)**

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. 2x8=16

i. Find the modulus of complex number $3+4i$.

ii. Simplify by justifying each step $\dfrac{\frac{1}{4}+\frac{1}{5}}{\frac{1}{4}-\frac{1}{5}}$ by writing properties.

iii. Factorize the expression $9a^2+16b^2$.

iv. Define absurdity and give one example.

v. Solve the system of linear equations. $\begin{aligned}4x_1+3x_2&=5\\3x_1-x_2&=7\end{aligned}$

vi. Find the value of x if $\begin{vmatrix}1&2&1\\2&x&2\\3&6&x\end{vmatrix}=0$.

vii. Define Row Rank of a matrix.

viii. Solve the equation $x^{-2}-10=3x^{-1}$.

ix. If $A=\{1,2,3,4\}, B=\{3,4,5,6,7,8\}, C=\{5,6,7,9,10\}$ verify distributivity of union over intersection.

x. Find the inverse of the relation $\{(1,3),(2,5),(3,7),(4,9),(5,11)\}$.

xi. Use remainder theorem to find the remainder when x^3-x^2+5x+4 is divided by $x-2$.

xii. Find the roots of the equation $16x^2+8x+1=0$ by using quadratic formula.

3. Write short answers of any eight parts from the following. 2x8=16

i. Resolve $\dfrac{1}{x^2-1}$ into partial fraction.

ii. Find 5th term of Geometric progression G.P 2,6,12,.......

iii. Define Circular permutation.

iv. Expand $(4-3x)^{\frac{1}{2}}$ upto three terms.

v. If $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in Arithmatic progression (A.P) show that common difference is $\dfrac{a-c}{2ac}$.

vi. If 5,6 are two Arithmatic Means (A.M) between "a" and "b". Find "a" and "b".

vii. If the numbers $\dfrac{1}{k},\dfrac{1}{2k+1},\dfrac{1}{4k-1}$ are in (H.P) Hormonic Progression, Find "K".

viii. How many words can be formed from the letters of PLAN" using all letters when no letter is to be repeated?

ix. If ${}^{n}c_5={}^{n}c_4$, where c stands for combination then find value of n.

x. Verify the inequality $n>2^n-1$ for integral values of $n=4,5$.

xi. If x is so small that its square and higher power cab be neglected, show that $\dfrac{1-x}{\sqrt{1-x}}=1-\dfrac{3}{2}x$.

xii. Prove that Hormonic Mean (H.M) between two numbers "a" and "b" is $\dfrac{2ab}{a+b}$.

4. Write short answers of any nine parts from the following. 2x9=18

i. Prove the fundamental identity $\cos^2\theta+\sin^2\theta=1$.

ii. Verify the result $\tan 2\theta=\dfrac{2\tan\theta}{1-\tan^2\theta}$ for $\theta=30^0$.

iii. Show that $\frac{\cos 11^0+\sin 11^0}{\cos 11^0-\sin 11^0}=\tan 56^0$.

iv. Prove that $\cos 330^0 \sin 600^0+\cos 120^0 \sin 150^0=-1$.

v. Find the period of $\operatorname{cosec}(10x)$.

vi. Show that $\gamma=4R\sin\frac{\alpha}{2}\sin\frac{\beta}{2}\sin\frac{\gamma}{2}$ with usual notation.

vii. Find the value of $\cos\left(\sin^{-1}\frac{1}{2}\right)$.

viii. Show that $\frac{\cot^2\theta-1}{1+\cot^2\theta}=2\cos^2\theta-1$.

ix. Exprss the following difference as the product of trignometric functions $\cos 7\theta-\cos\theta$.

x. In any triangle ΔABC, if $c=16.1, \alpha=42^0 45', \gamma=74^0 32'$, then find "$\beta$" and "$\alpha$".

xi. Find the area of triangle ABC, given two sides and their included angle $a=200, b=120, \gamma=150^0$.

xii. Find the solutions of the equation $\cot\theta=\frac{1}{\sqrt{3}}$ in the interval $[0,2\pi]$.

xiii. Find the values of θ satisfying the equation $3\tan^2\theta+2\sqrt{3}\tan\theta+1=0$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Verify De Morgan's Laws for the given sets: $U=\{1,2,3,........20\}, A=\{2,4,6,......20\}, B=\{1,3,5,......19\}$.

(b) Find the value of λ if A is singular matrix, $A=\begin{bmatrix}4 & \lambda & 3\\ 7 & 3 & 6\\ 2 & 3 & 1\end{bmatrix}$.

6. (a) If the roots of $px^2+qx+q=0$ are α and β, then prove that $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}+\sqrt{\frac{q}{p}}=0$.

(b) Resolve into partial fraction $\frac{x^8}{1-x^4}$.

7. (a) The sum of an infinite geometric series is 9 and sum of square of its terms is $\frac{81}{5}$. Find the series.

(b) If $y=\frac{2}{5}+\frac{1.3}{2!}\left(\frac{2}{5}\right)^2+\frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3+.........$, then prove that $y^2+2y-4=0$.

8. (a) A railway train is running on a circular track of radius 500 meters at the rate of 30Km per hour. Through what angle will it turn in 10 sec?

(b) If $\tan\alpha=\frac{-15}{8}$ and $\sin\beta=\frac{-7}{25}$ and neither the terminal side of the angle of measure α nor that of β is in IV quadrant. Find $\sin(\alpha+\beta)$ and $\cos(\alpha+\beta)$.

9. (a) One side of a triangular garden is 30m. If two corner angle are $22^0\frac{1}{2}$ and $112^0\frac{1}{2}$, find the cost of planting the grass at the rate of Rs.5 per square meter.

(b) Prove that $\tan^{-1}\frac{3}{4}+\tan^{-1}\frac{3}{5}-\tan^{-1}\frac{8}{19}=\frac{\pi}{4}$.

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Roll No. ________ to be filled in by the candidate.	(For all sessions)	Paper Code	6	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. Multiplicative identity of complex number is:

(A) (0,0) (B) (0,1) (C) (1,0) (D) (1,1)

2. The contrapositive of $\sim p \rightarrow \sim q$ is:

(A) $p \rightarrow q$ (B) $q \rightarrow p$ (C) $\sim q \rightarrow \sim p$ (D) $\sim q \rightarrow p$

3. If A and B are any two non singular matrices then $(AB)^{-1} =$

(A) $A^{-1}B^{-1}$ (B) $B^{-1}A^{-1}$ (C) BA (D) AB

4. For a non-singular matrix A if XA=B then $X =$

(A) $A^{-1}B$ (B) BA^{-1} (C) $(AB)^{-1}$ (D) $(BA)^{-1}$

5. If $f(x) = 3x^4 + 4x^3 + x - 5$ is divided by $x+1$, then remainder is:

(A) -6 (B) 7 (C) 6 (D) -7

6. If w is cue root of unity, then w^{15}=

(A) 1 (B) 0 (C) w (D) -w

7. Partial fraction of $\frac{3x-11}{(x^2+1)(x+3)}$ will be of the form.

(A) $\frac{Ax+B}{x^2+1} + \frac{C}{x+3}$ (B) $\frac{A}{x^2+1} + \frac{Bx+C}{x+3}$ (C) $\frac{Ax+B}{x+3} + \frac{C}{x^2+1}$ (D) $\frac{A}{x^2+1} + \frac{B}{x+3}$

8. If $a_n = (-1)^{n+1}$, then 26th term is:

(A) 1 (B) -1 (C) 26 (D) -26

9. $(n+1)^{th}$ term of G.P is:

(A) $a_1 r^{n\ 1}$ (B) $a_1 r^{n+1}$ (C) $a_1 r^{n+2}$ (D) $a_1 r^n$

10. n^{th} term of A P is.

(A) $a_1(n\ \ 1)d$ (B) $a_1 + (n+1)d$ (C) $2a_1 + (n-1)d$ (D) $a_1 + (2n-1)d$

11. With usual notation $\overset{n}{C}_{r} + \overset{n}{C}_{r-1} =$

(A) $\overset{n}{C}_{r+1}$ (B) $\overset{n+1}{C}_{r}$ (C) $\overset{n-1}{C}_{r-1}$ (D) $\overset{n+1}{C}_{r-1}$

12. In the expansion of $(a+b)^7$, the second term is:

(A) a^7 (B) $7a^6b$ (C) $7ab^6$ (D) 8

13. In one hour, the hour hand of a clock turns through an angle.

(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

14. $3\frac{\pi}{4}$ radian is equal to:

(A) 110^0 (B) 135^0 (C) 150^0 (D) 130^0

15. $\sin(-300^0) =$

(A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) 0

16. Period of $\sin x$ is:

(A) π (B) 2π (C) 3π (D) $-\pi$

17. Radius of escribed circle opposite to vertex C is:

(A) $\frac{\Delta}{s-a}$ (B) $\frac{\Delta}{s-b}$ (C) $\frac{\Delta}{s-c}$ (D) $\frac{\Delta}{s}$

18. With usual notation $a+b-c=$

(A) $2S$ (B) $2S-2C$ (C) $2S-2b$ (D) $2S-c$

19. $2\tan^{-1} A =$

(A) $\tan^{-1}\frac{2A}{1-A^2}$ (B) $\tan^{-1}\frac{2A}{1+A^2}$ (C) $\tan^{-1}\frac{A}{1-A^2}$ (D) $\tan^{-1}\frac{A}{1+A^2}$

20. Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in quadrant III is:

(A) $\frac{5\pi}{3}$ (B) $7\frac{\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\frac{7\pi}{3}$

Roll No. ________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section-I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Seperate into real and imaginary parts $\frac{2-7i}{4+5i}$.

ii. Factorize $3x^2+3y^2$.

iii. Simplify $(2,6)(3,7)$.

iv. Let $A=\{1,2,3,4\}$, Find the relation $\{(x,y)/x+y<5\}$ in A

v. Write the inverse and converse of $\sim p\rightarrow\sim q$

vi. Find the value of x if $\begin{vmatrix}3 & 1 & x\\ -1 & 3 & 4\\ x & 1 & 0\end{vmatrix}=-30$.

vii. Find the condition that one root of $x^2+px+q=0$ is multiplicative inverse of other.

viii. Evaluate $(1+w+w^2)(1-w+w^2)$.

ix. Solve the equation $ax=b$ where a,b are the elements of a group G

x. Discuss the nature of roots of the equation $2x^2-5x+1=0$.

xi. If $A=\begin{bmatrix}1 & 2\\ a & b\end{bmatrix}$ and $A^2=\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ then find the values of a and b.

xii. If A and B are square matrices of the same order, then explain why in general $(A+B)(A-B)\neq A^2-B^2$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Which term of the A.P, -2,4,10,..........is 148?

ii. Insert three G.M's between 1 and 16.

iii. Write in factorial form $\frac{(n+1)(n)(n-1)}{3.2.1}$.

iv. Find the value of n, when ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$

v. If 5 is the harmonic mean between 2 and b, find b.

vi. Find the number of diagonals of a 6-sided figure.

vii. Evaluate $\sqrt[3]{30}$ correct to two places of decimals.

viii. Expand by binomial theorem $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^3$.

ix. Resolve into partial fractions $\frac{7x+25}{(x+3)(x+4)}$.

x. Resolve into partial fractions without finding the constants $\frac{9x-7}{(x^2+1)(x+3)}$

xi. If $\frac{1}{a},\frac{1}{b}$ and $\frac{1}{c}$ are in G.P, show that the common ratio is $\pm\sqrt{\frac{a}{c}}$.

xii. Check whether, $1+\frac{1}{2}+\frac{1}{4}+........+\frac{1}{2^{n-1}}=2\left(1-\frac{1}{2^n}\right)$ is true for $n=1,2$

4. Write short answers of any nine parts from the following. **2x9=18**

i. Prove that $\sec^2\theta - \operatorname{cosec}^2\theta = \tan^2\theta - \cot^2\theta$. ii. Find the values of $\cos 105^0$ taking $\left(105^0 = 45^0 + 60^0\right)$

iii. Prove that $\dfrac{\sin 8x + \sin 2x}{\cos 8x + \cos 2x} = \tan(5x)$. iv. Find the period of $\tan(4x)$.

v. Show that $\gamma = (s-c)\tan\left(\dfrac{\gamma}{2}\right)$. vi. In ΔABC a=3,b=6 and B=36^{0}20' Find "b".

vii. Find area of ΔABC if a=18, b=24 and c=30. viii. Find the value of $\cos^{-1}\left(\dfrac{-1}{2}\right)$.

ix. Solve the equation $1+\cos x = 0$. x. Find the soln of equation $\sec x = -2$ which lies in $[0, 2\pi]$.

xi. What is the circular measure of the angle between the hands of a watch at 4 'o' clock.

xii. Find the values of remaining trigonometric functions when $\cos\theta = \dfrac{9}{41}$ and the terminal arm of the angle is in quad Iv

xiii. If α, β and γ are angles of a triangle ABC then prove that $\tan(\alpha+\beta) + \tan\gamma = 0$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ verify that $\left(A^{-1}\right)^t = \left(A^t\right)^{-1}$.

(b) Solve the system of equations $x+y=5\,;\ \dfrac{2}{x}+\dfrac{3}{y}=2$.

6. (a) Resolve $\dfrac{1}{(1-ax)(1-bx)(1-cx)}$ into partial fractions.

(b) For what value of n, $\dfrac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is the positive Geometric Meam (G.M) between a and b.

7. (a) Prove that ${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$.

(b) If x is so small that its cube and higher powers can be neglected then show that $\sqrt{\dfrac{1+x}{1-x}} \approx 1 + x + \dfrac{1}{2}x^2$.

8. (a) Two cities A and B lie on the equator such that their longitudes are 45^{0}E and 25^{0}W respectively. Find the distance between two cities, taking radius of earth as 6400 kms.

(b) Show that $\cos(\alpha+\beta)\cos(\alpha-\beta) = \cos^2\alpha - \sin^2\beta = \cos^2\beta - \sin^2\alpha$.

9. (a) The sides of a triangle are $x^2+x+1, 2x+1$ and x^2-1. Prove that the greatest angle of the triangle is 120^0

(b) Prove that $2\tan^{-1}\left(\dfrac{1}{3}\right) + \tan^{-1}\left(\dfrac{1}{7}\right) = \dfrac{\pi}{4}$.

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Roll No. ____________ (to be filled in by the candidate)   Inter. (Part-I)-A-2021

Mathematics (Objective Type)

(For all Sessions)   Paper Code | 6 | 1 | 9 | 6 |

Time: 30 Minutes   Marks: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1. $\frac{|3}{|0} =$
   (A) 0   (B) ∞ (C) 3   (D) 6
2. ${}^nC_r$ is valid only if.
   (A) $r < n$ (B) $r > n$ (C) $r \le n$ (D) $r \ge n$
3. Sum of exponents of a and b in the expansion of $(a+b)^n$ in each term is.
   (A) n (B) $2n$ (C) n^2 (D) $n+1$
4. End in the expansion of $\left(\frac{3x}{2}-\frac{1}{3x}\right)^{11}$ is ________.
   (A) 5^{th} (B) 7^{th} (C) 4^{th} (D) 8^{th}
5. What angle is quadrantal.
   (A) 30° (B) 45° (C) 270° (D) 190°
6. $1-\cos 2\theta =$
   (A) $2\sin^2\theta$ (B) $2\cos^2\theta$ (C) $2\sin^2\theta/2$ (D) $2\cos^2\theta/2$
7. Domain of Tangent function is R excluding. ____
   (A) $\frac{n\pi}{2}$ (B) $2n\frac{\pi}{3}$ (C) $(2n+1)\pi$ (D) $(2n+1)\frac{\pi}{2}$
8. With usual notation, $2S-b=$ ________
   (A) $a-c$ (B) $a+c$ (C) $2b+c$ (D) $2b+b+2c$
9. Radius of e – circle is given by.
   (A) $\frac{\Delta}{S-b}$ (B) $\frac{\Delta}{S+b}$ (C) $\frac{S-b}{\Delta}$ (D) $\frac{\Delta}{S+C}$
10. $x \ge +1$ or $x \le -1$ is the domain of.
   (A) $\sin x$ (B) $\cos^{-1} x$ (C) $\sec^{-1} x$ (D) $\cot^{-1} x$
11. The solution of $\sin x + \cos x = 0$ in $[0, 2\pi]$
   (A) $\frac{3\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{3}$
12. Argument (θ) of $(\sqrt{3}+i)$ is.
   (A) 60° (B) 30° (C) 45° (D) 90°
13. $\{1, \omega, \omega^2\}$ is group under.
   (A) Addition   (B) Subtraction   (C) Multiplication   (D) Intersection
14. For non singular matrices A and B $XA = B^{-1} \Rightarrow X =$
   (A) $A^{-1}B$ (B) AB^{-1} (C) $(AB)^{-1}$ (D) $(BA)^{-1}$
15. If order of A is $n \times m$ and order of B is $m \times n$ then order of $(AB)^t$ is.
   (A) $n \times m$ (B) $m \times m$ (C) $m \times n$ (D) $n \times n$
16. If $4^x = \frac{1}{2}$ then $x =$
   (A) $-\frac{1}{2}$ (B) -2 (C) $\frac{1}{2}$ (D) 2
17. If $x-a$ is a factor of $f(x)$, then for $f(x)=0$ $x=a$ is.
   (A) Root   (B) Factor   (C) Polynomial   (D) Degree
18. Partial fraction of $\frac{1}{x^3+1}$ will be of the form.
   (A) $\frac{A}{x+1}+\frac{B}{x^2+x+1}$ (B) $\frac{A}{x+1}+\frac{Bx+C}{x^2-x+1}$ (C) $\frac{A}{x+1}+\frac{Bx+C}{x^2+x+1}$ (D) $\frac{Ax+B}{x^2+1}+\frac{C}{x^2-x+1}$
19. Geometric series is convergent if.
   (A) $|r| < 1$ (B) $|r| > 1$ (C) $|r| \le 1$ (D) $|r| \ge 1$
20. $\sum_{k=1}^{n} k^2 =$
   (A) $\frac{n(n-1)(n-2)}{3}$ (B) $\frac{n(n-1)(n-2)}{6}$ (C) $\frac{n(n+1)(2n+1)}{3}$ (D) $\frac{n(n+1)(2n+1)}{6}$

Mathematics (subjective) A 2022 HSSC-(P-I) Marks: 80

section I

Q2 (i) Does the set $\{1,-1\}$ posesses closure property w.r.t '+' and '−'?
(ii) Simplify $(-1)^{-21/2}$ (iii) $\forall\, z \in C$, show that $|-z| = |z|$
(iv) From suitable properties of union and intersection deduce $A\cap(A\cup B) = A\cup(A\cap B)$
(v) Construct the truth table of the statement $(p\wedge \sim p)\to q$
(vi) Give the table for addition of elements of the set of residue classes modulo 5.
(vii) If $A = [a_{ij}]_{3\times 3}$ show that $(\lambda+\mu)A = \lambda A + \mu A$.
(viii) If all the entries of a column of a square matrix A are zero, show that $|A| = 0$
(ix) If the matrices A and B are symmetic and $AB = BA$, show that AB is symmetric
(x) Prove that product of all the three cube roots of unity is 1.
(xi) Discuss the nature of roots of the equation $2x^2-5x+1=0$
(xii) Show that $x^3-y^3 = (x-y)(x-\omega y)(x-\omega^2 y)$

Q3 (i) Define proper rational fraction. (ii) Resolve $\frac{1}{x^2-1}$ into partial fraction.
(iii) Which term of the AP $5, 2, -1, \cdots$ is -85?
(iv) Find the sum of 20 terms of the series whose r^{th} term is $3r+1$.
(v) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P, show that the common ratio is $\pm\sqrt{a/c}$
(vi) If $y = \frac{2}{3}x + \frac{4}{9}x^2 + \frac{8}{27}x^3 + \cdots$ if $0<x<\frac{3}{2}$, then show that $x = \frac{3y}{2(1+y)}$
(vii) If 5 is the harmonic mean between 2 and b, find b.
(viii) Find the value of n when ${}^{n}P_n = 11\cdot 10\cdot 9$
(ix) How many diagonals can be formed by going the vertices of the polygon having 8 sides?
(x) Use mathematical induction to prove that the formula for $n=1$ and $n=2$. $1+4+7+\cdots+(3n-2) = \frac{n(3n-1)}{2}$
(xi) Calculate $(2\cdot 02)^4$ by means of binomial theorem.
(xii) Expand $(4-3x)^{1/2}$ up to 3 terms, taking the values of x such that the expansion is valid.

Q4 (i) If $\cot\theta = 15/8$ and the terminal arm of angle is not in I quadrant find the values of $\cos\theta$ and $\operatorname{cosec}\theta$.
(ii) Find the values of trigonometric functions of $-\frac{7\pi}{4}$
(iii) Prove the identity $(\tan\theta+\cot\theta)^2 = \sec^2\theta\,\operatorname{cosec}^2\theta$
(iv) Prove that $\cos 306^\circ + \cos 234^\circ + \cos 162^\circ + \cos 18^\circ = 0$
(v) Prove that $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$ (vi) Prove the identity $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$
(vii) Find the period of $\cos\frac{x}{6}$. (viii) A man 18 dm tall observes that angle of elevation of top of tree at a distance of 12 m from him is 32°. What is the hight of the tree? (ix) Show that $r_1 r_2 r_3 = rs^2$
(x) Solve the ΔABC, given that $\alpha = 35^\circ 17'$, $\beta = 45^\circ 13'$, $b = 421$
(xi) Without using table/calculator, find $\cot^{-1}(-1)$ (xii) Solve $1+\cos x = 0$
(xiii) Find the value of 'θ' satisfying equation $4\sin^2\theta - 8\cos\theta + 1 = 0$

section II

Q5 (a) Solve the system of linear equations by Cramer's Rule
$2x+2y+z=3$; $3x-2y-2z=1$; $5x+y-3z=2$
(b) Show that the roots of $(mx+c)^2 = 4ax$ will be equal if $c = \frac{a}{m}$, $m\neq 0$

Q6 (a) Resolve $\frac{4x^2}{(x^2+1)^2(x-1)}$ into partial fraction.
(b) If three consective numbers in A.P are increased by 1, 4, 15 respectively, the resulting numbers are in G.P. Find the original numbers, if their sum is 6.

Q7 (a) A die is thrown. Find the probability that the dots on the top are prime numbers or odd numbers. (b) If $2y = \frac{1}{2^2} + \frac{1\times 3}{2!}\cdot\frac{1}{2^4} + \frac{1\times 3\times 5}{3!}\cdot\frac{1}{2^6} + \cdots$ then prove that $4y^2+4y-1=0$

Q8 (a) Find the values of the remaing trigonometric functions, if $\cos\theta = 9/41$ and the terminal arm of the angle is in Quadrant IV.
(b) Prove without using tables/calculator that $\sin 19^\circ\cos 11^\circ + \sin 71^\circ \sin 11^\circ = \frac{1}{2}$

Q9 (a) Measures of two sides of a triangle are in ratio 3:2 and they include an angle of measure 57°. Find the remaing two angles.
(b) Prove that $\sin^{-1}\frac{77}{85} - \sin^{-1}\frac{3}{5} = \cos^{-1}\frac{15}{17}$

Good Luck

☆☆ Roll No ________ to be filled in by the candidate | HSSC-(P-I)-A/2023 | Paper Code 6 1 9 3

Mathematics(Objective) (For All Sessions) Group-I Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

Lwp-11-1-23

1.1 $\frac{abc}{4\Delta} =$
(A) r_1 (B) r (C) R (D) Δ

2. In any ΔABC $\sqrt{\frac{S(S-c)}{ab}}$ is:
(A) $Cos\,{}^{\alpha}/_{2}$ (B) $Cos\,{}^{\beta}/_{2}$ (C) $Cos\,{}^{\gamma}/_{2}$ (D) $Cos\,\alpha$

3. $Cos\,(Tan^{-1}0) =$ ____
(A) -1 (B) 1 (C) $-\frac{1}{2}$ (D) $\frac{1}{2}$

4. Solution of $1 + Cosx = 0$ in $[0, 2\pi]$ is:
(A) π (B) $\frac{\pi}{2}$ (C) $\frac{3\pi}{2}$ (D) $\frac{5\pi}{2}$

5. The set{1} possess closure property under:
(A) Addition (B) Multiplication (C) Subtraction (D) Both A & B

6. A function $f: A \to B$ is called an onto function if:
(A) Range of $f = A$ (B) Range of $f \neq A$ (C) Range of $f = B$ (D) Range of $f \neq B$

7. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$ then $|A| =$ ____
(A) 4 (B) 7 (C) 10 (D) 13

8. If order of a matrix "A" is $m \times n$ and order of matrix "B" is $n \times p$ then order of product of matrices AB is:
(A) $m \times p$ (B) $n \times p$ (C) $m \times n$ (D) $p \times n$

9. The roots of $x^2 - 7x + 10 = 0$ are:
(A) $-2, -5$ (B) $2, 5$ (C) $-2, 5$ (D) $2, -5$

10. If α, β are the roots of $3x^2 - 2x + 4 = 0$, then sum of roots is:
(A) $\frac{2}{3}$ (B) $-\frac{2}{3}$ (C) $\frac{4}{3}$ (D) $-\frac{4}{3}$

11. Partial fractions of $\frac{1}{(x-1)(x+1)}$ are:
(A) $\frac{A}{x-1} + \frac{B}{x+1}$ (B) $\frac{Ax+B}{x-1} + \frac{C}{x+1}$ (C) $\frac{A}{x-1} + \frac{Bx+c}{x+1}$ (D) $\frac{Ax+B}{x^2-1}$

12. Next two terms of sequence 7, 9, 12, 16, ... are:
(A) 18, 20 (B) 19, 21 (C) 20, 22 (D) 21, 27

13. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P then common ratio is:
(A) $\pm\sqrt{\frac{b}{a}}$ (B) $\pm\sqrt{\frac{a}{c}}$ (C) $\pm\sqrt{\frac{b}{c}}$ (D) $\pm\sqrt{\frac{c}{b}}$

14. $^{n}P_{2} = 30$, then n is:
(A) 6 (B) 5 (C) 4 (D) 3

15. In how many ways can 4-keys be arranged on a circular key ring:
(A) 1 (B) 2 (C) 3 (D) 4

16. $n! > n^2$ is true for $n =$
(A) 1 (B) 2 (C) 3 (D) 4

17. The formula for $(r+1)th$ term of binomial expansion of $(a+x)^n$ is:
(A) $\binom{n}{r} a^{n-r} x^r$ (B) $\binom{n}{r} a^{n+r} x^r$ (C) $\binom{n}{r} a^n x^{n-r}$ (D) $\binom{n}{r} a^n x^{n+r}$

18. Which one is the quadrantal angle:
(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

19. $Cos\,2\alpha =$ ____
(A) $1 - 2\,Cos^2\alpha$ (B) $2\,Cos^2\alpha - 1$ (C) $Sin\,\alpha\,Cos\,\alpha$ (D) $2Sin\,\alpha\,Cos\,\alpha$

20. Period of Cosec $\frac{x}{4}$ is:
(A) 2π (B) 4π (C) 6π (D) 8π

821-11-A7

Roll No ______ to be filled in by the candidate

HSSC-(P-I)-A/2023

Marks : 80

Mathematics (Subjective) (For All Sessions) (GROUP-I)

Time: 2:30 hours

Rwp-11-1-23

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Name the properties used in equations: (a): $100 + 0 = 100$ (b): $1000 \times 1 = 1000$

ii. Separate into real and imaginary parts, if $Z = \frac{i}{1+i}$

iii. Differentiate between Equal and Equivalent sets, with example.

iv. Write the set: $\{x \mid x \in N \wedge 4 < x < 12\}$, in descriptive and tabular forms:

v. Define semi-group.

vi. Find values of x if $\begin{vmatrix} 3 & 1 & x \\ -1 & 3 & 4 \\ x & 1 & 0 \end{vmatrix} = -30$

vii. If the matrices A and B are symmetric and $AB = BA$, show that AB is symmetric.

viii. If $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$, find $A + (\bar{A})^t$

ix. Solve: $x(x + 7) = (2x-1)(x+4)$ by factorization.

x. If ω is a cube root of unity, form an equation whose roots are $Z\omega$ and $Z\omega^2$

xi. Find two consecutive numbers, whose product is 132.

xii. Find the three cube roots of -8

3. Write short answers of any eight parts from the following: (8x2=16)

i. Without finding constants write $\frac{x^2-10+13}{(x-1)(x^2-5x+6)}$ into partial fractions.

ii. Find vulgar fraction equivalent to recurring decimal $0.\dot{7}$

iii. Find the nth term of sequence $\left(\frac{4}{3}\right)^2, \left(\frac{7}{3}\right)^2, \left(\frac{10}{3}\right)^2, \ldots$

iv. Calculate geometric means between 4 and 16.

v. If $y = \frac{2x}{3} + \frac{4x^2}{9} + \frac{8x^3}{27} + \cdots$ and if $0 < x < 3/2$, then show that $x = \frac{3y}{2(1+y)}$

vi. Find 12th term of H.P: $1/3, 2/9, 1/6, \ldots$

vii. Find the term involving x^{-2} in the expansion of $\left(x - \frac{2}{x^2}\right)^{13}$

viii. How many words can be formed from PLANE using all letters when no letter is to be repeated.

ix. Write formula for "^nP_r" and "^nC_r"

x. A die is thrown. Find the probability that dots on top are prime numbers.

xi. Expand $(1 - x)^{1/2}$ up to 4 terms by binomial theorem.

xii. If x is so small that its square and higher powers be neglected, then show that: $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1 + \frac{3x}{2}$

4. Write short answers of any nine parts from the following: (9x2=18)

i. Define the word "Trigonometry"

ii. Find $\tan\theta$ and $\cot\theta$ for $\theta = \frac{19\pi}{3}$

iii. Show that $\sin^2\left(\frac{\pi}{6}\right) + \sin^2\left(\frac{\pi}{3}\right) + \tan^2\left(\frac{\pi}{4}\right) = 2$

iv. Find the value of $\cos\left(\frac{\pi}{12}\right)$

v. Prove that $Sin(180^0 + \alpha)\, Sin(90^0 - \alpha) = -Sin\,\alpha\, Cos\,\alpha$.

vi. Define the principal tangent function.

vii. Prove that $Sin(\alpha + \beta)Sin(\alpha - \beta) = cos^2\beta - cos^2\alpha$.

viii. Define the period of a Trigonometry function

ix. Solve the right triangle ABC in which: $\gamma = 90^0$, $b = 68.4$, $c = 96.2$

x. Solve the triangle ABC if $\beta = 60^0$, $\gamma = 15^0$, $b = \sqrt{6}$

xi. Find the area of triangle ABC for $b = 21.6$, $c = 30.2$, $\alpha = 52^0 40'$

xii. Define the trigonometric equation.

xiii. Find the solution of Cosec $\theta = 2$ which lie in the interval $[0, 2\pi]$

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Find the matrix A if: $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} A = \begin{bmatrix} 0 & -3 & 8 \\ 3 & 3 & -7 \end{bmatrix}$

(b) For what values of "m" the roots of the equation $x^2 - 2(1 + 3m)x + 7(3 + 2m) = 0$ be equal?

6. (a) Resolve into partial fractions $\frac{x^2}{(x-2)(x-1)^2}$

(b) Find the values of n and r when $^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3 : 6 : 11$

7. (a) Sum the series up to n terms $2 + (2 + 5) + (2 + 5 + 8) + \cdots$

(b) Use binomial theorem to show that: $1 + \frac{1}{4} + \frac{1.3}{4.8} + \frac{1.3.5}{4.8.12} + \cdots = \sqrt{2}$

8. (a) Prove that $\frac{tan\theta + Sec\theta - 1}{tan\theta - sec\theta + 1} = tan\theta + sec\theta$

(b) Prove that $cos20^0 + cos100^0 + cos140^0 = 0$

9. (a) The measures of sides of a triangular plot are 413, 214 and 375 meters. Find the measure of corner angles of the plot.

(b) ... ^{3} ... $^{-1}\frac{8}{}$ ... $^{-1}\frac{77}{}$ [illegible]

Paper Code | 6 | 1 | 9 | 8

☆☆☆☆☆ Roll No ______ to be filled in by the candidate

HSSC-(P-I)-A/2023

Mathematics (Objective) (For All Sessions) Group-II

Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

Rwp-11-2-23

1.1 The sum of infinite geometric series with common ratio $|r| < 1$ is:
(A) $\frac{a}{1-r}$ (B) $\frac{a}{1+r}$ (C) $\frac{a}{1-r^2}$ (D) $\frac{a}{1+r^2}$

2. A die is rolled. The probability that the dot on the top is greater than 4 is:
(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

3. The value of ${}^{12}C_{10} =$
(A) 11 (B) 66 (C) 22 (D) 2

4. The sum of exponents of a and b in every term in the expansion of $(a+b)^n$ is:
(A) 1 (B) $n+1$ (C) n (D) $n-1$

5. The inequality $n! > 2^n - 1$ is valid if n is:
(A) $n = 3$ (B) $n \le 3$ (C) $n > 3$ (D) $n \ge 3$

6. $\frac{2\pi}{3}$ $radians =$
(A) 120^0 (B) 60^0 (C) 90^0 (D) 30^0

7. $Sin\,(2\pi - \theta) =$
(A) $Sin\theta$ (B) $-Sin\theta$ (C) $Cos\theta$ (D) $-Cos\theta$

8. The period of $Sin\,2x =$
(A) 2π (B) -2π (C) π (D) $-\pi$

9. $\sqrt{\frac{s(s-a)}{bc}} =$
(A) $\sin\frac{\alpha}{2}$ (B) $\sin\frac{\beta}{2}$ (C) $\cos\frac{\alpha}{2}$ (D) $\cos\frac{\beta}{2}$

10. Hero's formula for area of triangle is:
(A) $\sqrt{s(s-a)(s-b)(s-c)}$ (B) $\frac{1}{2}bc\sin\alpha$ (C) $\frac{C^2 \sin\alpha \sin\beta}{2\sin r}$ (D) $\frac{1}{2}ab\sin r$

11. $Sin^{-1}\left(-\frac{1}{2}\right) =$
(A) $\frac{\pi}{3}$ (B) $-\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $-\frac{\pi}{6}$

12. If $sinx = cosx$ then $x =$
(A) 0^0 (B) 30^0 (C) 45^0 (D) 60^0

13. The equation $x^2 + 1 = 0$ has solution in:
(A) R (B) C (C) Q (D) Q′

14. Let $p \to q$ be a given conditional then $\sim q \to \sim p$ is:
(A) Converse (B) Inverse (C) Contra positive (D) Positive

15. If A and B are non singular matrices, then $(AB)^{-1}$ is equal to.
(A) $\frac{1}{AB}$ (B) $A^{-1}B^{-1}$ (C) BA (D) $B^{-1}A^{-1}$

16. $AX = 0$ is homogeneous system with $|A| \ne 0$ then system has:
(A) No solution (B) Trivial solution (C) Non-trivial solution (D) Infinite solution

17. If $4^{-x} = \frac{1}{2}$ then $x =$
(A) 1 (B) $-\frac{1}{2}$ (C) -1 (D) $\frac{1}{2}$

18. An equation which remains unchanged when x is replaced by $\frac{1}{x}$ is:
(A) Exponential (B) Reciprocal (C) Radical (D) Reducible

19. Partial fractions of $\frac{1}{x^2-1}$ will be of the form:
(A) $\frac{A}{x+1} + \frac{B}{x-1}$ (B) $\frac{Ax+B}{x^2-1}$ (C) $\frac{Ax}{x+1} + \frac{B}{x-1}$ (D) $\frac{A+Bx}{x^2-1}$

20. General term of the sequence 1,3,5 ... is:
(A) $2n+2$ (B) $2n$ (C) $2n-1$ (D) $3n$

823-11-A-

Roll No ________ to be filled in by the candidate

HSSC-(P-I)-A/2023 ایف۔جی اسٹڈی ڈاٹ کام

(For All Sessions)

GROUP-II

Marks: 80

Time: 2:30 hours

Mathematics (Subjective)

Rwp-11-2-23

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Find the multiplicative inverse of $(-4,7)$

ii. Prove that $\bar{z} = z$ if z is a real number.

iii. Write down the power set of $\{9, 11\}$

iv. Construct the truth table for $(P \wedge \sim P) \rightarrow q$

v. Define a group.

vi. If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ find the value of a and b.

vii. Find x if $\begin{vmatrix} 1 & x-1 & 3 \\ -1 & x+1 & 2 \\ 2 & -2 & x \end{vmatrix} = 0$

viii. Show that AA^t is symmetric for any matrix of order $3x3$.

ix. Solve the equation: $(a+b)x^2 + (a+2b+c)x + b + c = 0$

x. Find the condition that one root of $x^2 + px + q = 0$ is double the other.

xi. Show that the roots of $(mx+c)^2 = 4ax$ will be equal if $C = \frac{a}{m}, m \neq 0$

xii. Solve the equations simultaneously: $x + y = 5;\ x^2 + 2y^2 = 17$

3. Write short answers of any eight parts from the following: (8x2=16)

i. Resolve into $\frac{1}{x^2-1}$ partial fraction.

ii. Write the first three terms of $\{a_n\} = \{\frac{1}{2^n}\}$

iii. If nth term of the $A.P.$ is $3n - 1$, find the $A.P.$

iv. Evaluate: 4!.0!.1!

v. Which term of the sequence: $x^2 - y^2, (x+y), \frac{(x+y)}{(x-y)}, \ldots$ is $\frac{x+y}{(x-y)^9}$?

vi. Define Harmonic Mean. Also derive formula.

vii. How many numbers greater than 1000,000 can be formed from the digits 0,2,2,2,3,4,4?

viii. Find the value of n when ${}^nC_{10} = \frac{12 \times 11}{2!}$

ix. Prove that: $n! > n^2$ for $n = 4, 5$.

x. Expand $(1+x)^{-2}$ upto 3 terms.

xi. Find the sum of infinite $G.P.\ 2, \sqrt{2}, 1, \ldots$

xii. Using binomial theorems: $(1.03)^{1/3}$, calculate the value upto three decimal places.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Find θ when $l = 1.5\ cm$, $r = 2.5\ cm$

ii. Write domain and range of $\sin x$

iii. If $\tan\theta < 0$ and , in which quadrant θ will lie.

iv. Prove than $\sin^2 \pi/6 + \sin^2 \pi/3 + \tan^2 \pi/4 = 2$

v. Prove that $R = \frac{abc}{4\Delta}$

vi. Find the distance between $A(3,8)$ and $B(5,6)$.

vii. State law of Sines.

viii. Prove that $sin(45^0 + \propto) = \frac{1}{\sqrt{2}}(sin \propto + cos \propto)$

ix. Find the value of $\sin 2\propto$ when $cos \propto = \frac{3}{5}$ and $0 < \propto < \pi/2$

x. For ΔABC if $\propto = 35°17'$; $\beta = 45°13'$; $b = 421$ find a and r.

xi. Find the value of $cos(sin^{-1}\frac{1}{\sqrt{2}})$

xii. Solve $cosx = \frac{\sqrt{3}}{2}$ where $x \in [0, 2\pi]$

xiii. Define trigonometric equation. Give one example.

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Reduce the following matrix into echelon form: $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$

(b) For what value of m will the roots of following equation be equal?
$(1+m)x^2 - 2(1+3m)x + (1+8m) = 0$

6. (a) Resolve $\frac{x^2+1}{x^3+1}$ into partial fractions.

(b) A card is drawn from a deck of 52 playing cards. What is the probability that it is a diamond card or an ace?

7. (a) Show that sum of $n.\ A.Ms$ between 'a' and 'b' is equal to $n\ times$ their $A.M.$

(b) If x is very near equal to 1. Then prove that $Px^p - qx^q \approx (p-q)x^{p+q}$

8. (a) A railway train is running on circular track of radius 500 meters at the rate of 30 km per hours. Through what angle it turn in 10 seconds.

(b) Show that $cos20° \, cos40° cos80° = \frac{1}{8}$

9.(a) Show that $r_1 = 4R \sin\frac{\alpha}{2} . \cos\frac{\beta}{2} . \cos\frac{\gamma}{2}$

(b) Prove that $tan^{-1}\frac{20}{} = 2\, Cos^{-1}\frac{12}{}$

☆☆☆☆	Roll No ________

HSSC-(P-I)-A/2024
(For All Sessions)

Paper Code	6	1	9	7

Mathematics(Objective)

Group-I RWP-1-24

Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 Four 4^{th} roots of 625 are:
(A) $\pm4, \pm4i$ (B) $\pm5, \pm5i$ (C) $\pm16, \pm16i$ (D) $\pm25, \pm25i$

2. Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ are of the form:
(A) $\frac{A}{x+1}+\frac{B}{x-1}$ (B) $\frac{Ax}{x+1}+\frac{B}{x-1}$ (C) $1+\frac{A}{x+1}+\frac{B}{x-1}$ (D) $\frac{Ax+B}{x+1}+\frac{Cx+D}{x-1}$

3. $A.M$ between $x-3$ and $x+5$ is:
(A) $x+1$ (B) $x-1$ (C) $x-3$ (D) $x+5$

4. No term of a $G.P$ can be:
(A) 0 (B) 1 (C) -1 (D) i

5. $8.7.6 =$
(A) $\frac{8!}{8}$ (B) $\frac{8!}{7!}$ (C) $\frac{8!}{6!}$ (D) $\frac{8!}{5!}$

6. $4^n > 3^n + 4$ is true for integers:
(A) $n \geq 2$ (B) $n \geq 3$ (C) $n \geq 4$ (D) $n \geq 5$

7. If $sin\theta < 0$ and $cos\theta > 0$, then terminal arm of θ lies in quadrant:
(A) I (B) II (C) III (D) IV

8. $\frac{1-cos\theta}{2} =$
(A) $sin\theta$ (B) $sin^2\frac{\theta}{2}$ (C) $cos\,\theta$ (D) $cos^2\frac{\theta}{2}$

9. Range of $y = tanx$ is:
(A) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$ (B) $-\infty < y < \infty$ (C) $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$ (D) $-\infty < x < \infty$

10. $2R\,sin\,\alpha =$
(A) r (B) S (C) Δ (D) a

11. $Sin\left(cos^{-1}\frac{\sqrt{3}}{2}\right) =$
(A) $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{\sqrt{3}}$ (D) 1

12. Reference Angle for $1 - 2\,sinx = 0$ is:
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

13. $\forall\, z \in C$, which one is true:
(A) $z = -z$ (B) $\bar{z} = -z$ (C) $\bar{\bar{z}} = z$ (D) $\bar{\bar{z}} = -z$

14. A prime number can be factor of a square only if it occurs in it at least.
(A) Once (B) Twice (C) Thrice (D) Four times

15. If A and B are disjoint sets, then $A - B =$
(A) B (B) A (C) $B - A$ (D) ϕ

16. The converse of $\sim p \rightarrow q$ is:
(A) $q \rightarrow \sim p$ (B) $p \rightarrow q$ (C) $q \rightarrow p$ (D) $p \rightarrow \sim q$

17. $p \wedge q$ is called:
(A) Conjunction (B) Disjunction (C) Conditional (D) Equivalence

18. $(AB)^t =$
(A) A^tB^t (B) A^tB (C) AB (D) B^tA^t

19. A square matrix A is anti-symmetric if:
(A) $A^t = -A$ (B) $A^t = A$ (C) $\bar{A} = A$ (D) $\bar{A} = -A$

20. $1 + \omega + \omega^2 =$
(A) 1 (B) ω (C) ω^2 (D) 0

825-11-A

Roll No ____

HSSC-(P-I)-A/2024
(For All Sessions)

Marks

Time: 2:30 hours

(GROUP-I)

Mathematics (Subjective)

RWP-1-24

SECTION-I

(8x2=16)

2. Write short answers of any eight parts from the following:

i. Define a complex number. Is 0 a complex number?

ii. Whether the set $\{0, -1\}$ is closed or not $w.r.t$ addition and multiplication.

iii. Factorize: $3x^2 + 3y^2$

iv. Find multiplicative inverse of $-3-5i$

v. Construct truth table of $\sim(p \to q) \to p$

vi. Define monoid.

vii. Find the matrix X if: $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

viii. If A and B are square matrices of the same order, then explain why in general $(A+B)^2 \neq A^2 + 2AB + B^2$

ix. If $A = \begin{bmatrix} 1 \\ 1+i \\ i \end{bmatrix}$, find $A(\bar{A})^t$

x. Find four fourth roots of 81

xi. Use the remainder theorem to find the remainder when $x^3 - 2x^2 + 3x + 3$ is divided by $x - 3$

xii. If α, β are the roots of $3x^2 - 2x + 4 = 0$, find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

(8x2=16)

3. Write short answers of any eight parts from the following:

i. Define conditional equation.

ii. Resolve $\frac{x^2+15}{(x^4+2x+5)(x-1)}$ into partial fraction without finding constants.

iii. Find the first four terms of the sequence $a_n = \frac{n}{2n+1}$

iv. Determine whether -19 is a term of 17, 13, 9, ...

v. Find the 5th term of the G.P 3, 6, 12, ...

vi. Sum the series $\frac{3}{\sqrt{2}} + 2\sqrt{2} + \frac{5}{\sqrt{2}} + \cdots + a_{13}$

vii. Prove from the first principle that ${}^nP_r = n\,.\,{}^{n-1}P_{r-1}$

viii. Find the value of n when ${}^nC_{12} = {}^nC_6$

ix. Determine the probability of getting dots less than 5 when a die is rolled.

x. Prove that $n! > 2^n - 1$ for $n = 4, 5$

xi. Calculate $(2.02)^4$ by means of binomial theorem.

xii. Expand $(1+2x)^{-1}$ up to 4 terms.

(9x2=18)

4. Write short answers of any nine parts from the following:

i. Write values of trigonometric functions for $\theta = \frac{-9}{2}\pi$.

ii. Prove that $t^2\theta - cos^2\theta = cot^2\theta\, cos^2\theta$.

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RWP-1-24

iii. Prove that $sin(\theta + 270) = -cos\theta$.

iv. Prove that $sin2\theta = 2sin\theta\ cos\theta$.

v. Express $sin12^\circ\ sin46^\circ$ as sum or difference.

vi. Write domain and range of $cos\ x$.

vii. Find period of $sin\frac{x}{3}$.

viii. Draw the graph of $tanx$ for $x \in (0, \pi)$

ix. Prove that $r = (s - b)tan\frac{\beta}{2}$.

x. Write any two half angle formulae.

xi. When angle between ground and sun is 30°, flag pole casts a shadow of $40m$ long. Find height of top of flag.

xii. Show that $cos(sin^{-1}x) = \sqrt{1 - x^2}$.

xiii. Solve the equation $4\ cos^2x - 3 = 0$

SECTION-II

Note: Attempt any three questions. Each question carries equal marks: (10x3=30)

5.(a) If $\propto$ and β are the roots of $x^2 - 3x + 5 = 0$, form the equation whose roots are $\frac{1-\propto}{1+\propto}$ and $\frac{1-\beta}{1+\beta}$

(b) Find the rank of matrix $\begin{bmatrix} 1 & -1 & 2 & 1 \\ 2 & -6 & 5 & 1 \\ 3 & 5 & 4 & -3 \end{bmatrix}$

6. (a) Resolve $\frac{1}{(x+1)^2(x^2+2)}$ into partial fractions.

(b) Find six arithmetic means between 2 and 5.

7. (a) A die is thrown. Find the probability that the no. of dots on the top are prime numbers or odd numbers.

(b) If x is so small that its cube or higher powers can be neglected, show that $\sqrt{\frac{1-x}{1+x}} \approx 1 - x + \frac{1}{2}x^2$

8. (a) Solve the triangle ABC, given that $\propto = 35^\circ\ 17'$ $\beta = 45^\circ\ 13'$, $b = 421$.

(b) Reduce $cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

9. (a) A circular wire of radius $6\ cm$ is cut straightened and then bent so as to lie along the circumference of a hoop of radius $24\ cm$. Find the measure of the angle which it subtends at the center of the hoop.

(b) Prove that: $tan^{-1}\frac{1}{4} + tan^{-1}\frac{1}{5} = tan^{-1}\frac{9}{19}$

☆ Roll No 755876

HSSC-(P-I)-A/2024
(For All Sessions)

Paper Code	6	1	9	2

Mathematics (Objective)

Group-II RWP-2-24

Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 A complex number $1+i$ can also be expressed as:
(A) $2(\cos 45° + i\sin 45°)$ (B) $\sqrt{2}(\cos 45° - i\sin 45°)$ (C) $\sqrt{2}(\cos 45° + i\sin 45°)$ (D) $2(\cos 45° - i\sin 45°)$

2. If Z is a complex number and $Z = \overline{Z}$ then Z must be:
(A) Real (B) Imaginary (C) Rational (D) Irrational

3. The set $\{(a,b)\}$ is called:
(A) Infinite set (B) Singleton set (C) Empty set (D) Set with two elements

4. Drawing conclusion from premises believed to be true is called:
(A) Proposition (B) Contradiction (C) Induction (D) Deduction

5. If p is a logical statement $p \wedge \sim p$ is always:
(A) Absurdity (B) Contigency (C) Tautology (D) Conditional

6. If $A = [a \quad b \quad c]$, then order of A^t is:
(A) 1×3 (B) 3×1 (C) 3×3 (D) 1×1

7. If the matrix $\begin{bmatrix} \lambda & 1 \\ -2 & 1 \end{bmatrix}$ is singular then $\lambda =$
(A) 2 (B) 1 (C) -1 (D) -2

8. IF $4^{3x} = \frac{1}{2}$ then x is equal to:
(A) $-\frac{1}{6}$ (B) -6 (C) $\frac{1}{6}$ (D) 6

9. If ω is cube root of unity, then $\omega + \omega^2 =$
(A) 0 (B) -1 (C) 1 (D) $\frac{1}{\omega}$

10. From the identity $5x + 4 = A(x-1) + B(x+2)$, value of B is:
(A) -3 (B) 3 (C) -2 (D) 2

11. Which of the term cannot be a term of G.P:
(A) -1 (B) 1 (C) 0 (D) 5

12. $\sum_{k=1}^{n} K$ is equal to:
(A) $\frac{n+1}{2}$ (B) $\frac{n(n+1)}{2}$ (C) $\frac{n(n+1)(2n+1)}{6}$ (D) $\frac{n(n-1)}{2}$

13. $\frac{{}^nP_r}{r!}$ is equal to:
(A) ${}^nC_r$ (B) ${}^nC_{r-1}$ (C) ${}^{n+1}C_r$ (D) ${}^{n-1}C_r$

14. In expansion of $(a+b)^{16}$ middle term will be:
(A) $11th$ (B) $12th$ (C) $8th$ (D) $9th$

15. Which of the following is **NOT** Quadrantal angle? (A) $\frac{9}{2}\pi$ (B) 13π (C) $\frac{4}{3}\pi$ (D) $\frac{\pi}{2}$

16. The angle $\frac{3\pi}{2} - \theta$ lies in quadrant: (A) I (B) II (C) III (D) IV

17. The range of $\sin x$ is: (A) $[-1,1]$ (B) $[-1,0]$ (C) $[0,2]$ (D) $[-2,2]$

18. The radius of inscribed circle is: (A) $\frac{abc}{4\Delta}$ (B) $\frac{S}{\Delta}$ (C) $\frac{\Delta}{S-a}$ (D) $\frac{\Delta}{S}$

19. $Cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right)$ is equal to: (A) $\frac{1}{2}$ (B) $\frac{\pi}{4}$ (C) $\frac{1}{\sqrt{2}}$ (D) $-\frac{\pi}{4}$

20. If $\sin x = \frac{1}{2}$, then reference angle is: (A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $-\frac{\pi}{6}$ (D) $\frac{\pi}{6}$

Roll No ________ to be filled in by the candidate

HSSC-(P-I)-A/2024

(For All Sessions)

(GROUP-II)

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

SECTION-I

RWP-2-24

2. Write short answers of any eight parts from the following: (8x2=16)

i. Does the set $\{1,-1\}$ possess closure property $w.r.t$ multiplication? Construct the multiplication table.

ii. If $\frac{a}{b}=\frac{c}{d}$, prove that $ad=bc$

iii. Factorize a^2+4b^2

iv. Simplify by expressing in the form $a+bi$: $(2+\sqrt{-3})(3+\sqrt{-3})$

v. If $B=\{1,2,3\}$ then write down the power set of B

vi. Determine whether the statement $p\rightarrow(q\rightarrow p)$ is a tautology or not.

vii. Under what conditions, the determinant of a square matrix A is zero. Write any two conditions.

viii. If $A=\begin{bmatrix}1 & 2\\ a & b\end{bmatrix}$ and $A^2=\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$, find the values of a and b.

ix. Determine whether the matrix $A=\begin{bmatrix}1 & 1+i\\ 1-i & 2\end{bmatrix}$ is hermitian matrix or skew-hermitian matrix.

x. Solve the equation: $x^{-2}-10=3x^{-1}$

xi. Find four fourth roots of 16.

xii. Show that the roots of equation will be rational $px^2-(p-q)x-q=0$

3. Write short answers of any eight parts from the following: (8x2=16)

i. Define an identity with example.

ii. Resolve into partial fraction $\frac{1}{x^2-1}$

iii. The $7th$ and $10th$ terms of an H.P are $\frac{1}{3}$ and $\frac{5}{21}$ respectively, find its $14th$ term.

iv. Find the sum of first 15 terms of geometric sequence $1,\frac{1}{3},\frac{1}{9},\ldots$

v. Insert two G.M's between 2 and 16.

vi. How many terms of the series $-7+(-5)+(-3)+\cdots$ amount to 65

vii. A card in drawn from a deck of 52 playing cards. What is the probability that it is a diamond card or an ace?

viii. Find n, if ${}^nC_8={}^nC_{12}$

ix. How many different 4-digit numbers can be formed out of the digits 1, 2, 3, 4, 5, 6, when no digit is repeated?

x. Use mathematical induction to prove that $3+3.5+3.5^2+\cdots+3.5^n=\frac{3(5^{n+1}-1)}{4}$ for $n=1,2$

xi. Calculate by means of binomial theorem $(2.02)^4$

xii. Expand upto 4 – terms $(1-x)^{1/2}$

4. Write short answers of any nine parts from the following: (9x2=18)

i. Find r, when $l=56cm,\theta=45°$

ii. Verify that $sin2\theta=2sin\theta cos\theta$ for $\theta=45°$

iii. Write the fundamental law of trigonometry.

iv. Show that $cos(\alpha+\beta)\,cos(\alpha-\beta) = cos^2\alpha - sin^2\beta$.

RWP-2-24

v. Express $sin5x + sin7x$ as a product.

vi. Define the period of trigonometric function.

vii. Write down the domain and range of tangent function.

viii. Find the period of $sin\frac{x}{3}$.

ix. Solve the right triangle ABC, in which $\gamma = 90°, a = 3.28,\ b = 5.74$.

x. Define half angle formulas for tangent.

xi. Define Hero's formula.

xii. Find the value of $sin(tan^{-1}(-1))$

xiii. Solve the equation $sin2x = cosx$ where $x \in [0, 2\pi]$

SECTION-II

Note: **Attempt any three questions. Each question carries equal marks:** (10x3=30)

5.(a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(b) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots if $c^2 = a^2m^2 + b^2;\ a \neq 0, b \neq 0$

6. (a) Resolve into partial fractions $\frac{6x^3+5x^2-7}{2x^2-x-1}$

(b) The $A.M$ between the two numbers is 5 and their positive $G.M.$ is 4 find the numbers.

7. (a) Prove that ${}^{n}C_r + {}^{n}C_{r-1} = {}^{n+1}C_r$.

(b) Find the coefficient of x^5 in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

8. (a) Reduce $sin^4\theta$ to an expression involving only functions of multiples of θ raised to the first power.

(b) With usual notations, prove that $r = s.\tan{}^{\alpha}/_{2}.tan{}^{\beta}/_{2}.tan{}^{\gamma}/_{2}$

9. (a) If $cot\theta = \frac{5}{2}$, and θ is in quadrant I, find the value of $\frac{3sin\theta+4cos\theta}{cos\theta-sin\theta}$

(b) Prove that $cos^{-1}\frac{63}{65} + 2tan^{-1}\frac{1}{5} = sin^{-1}\frac{3}{5}$